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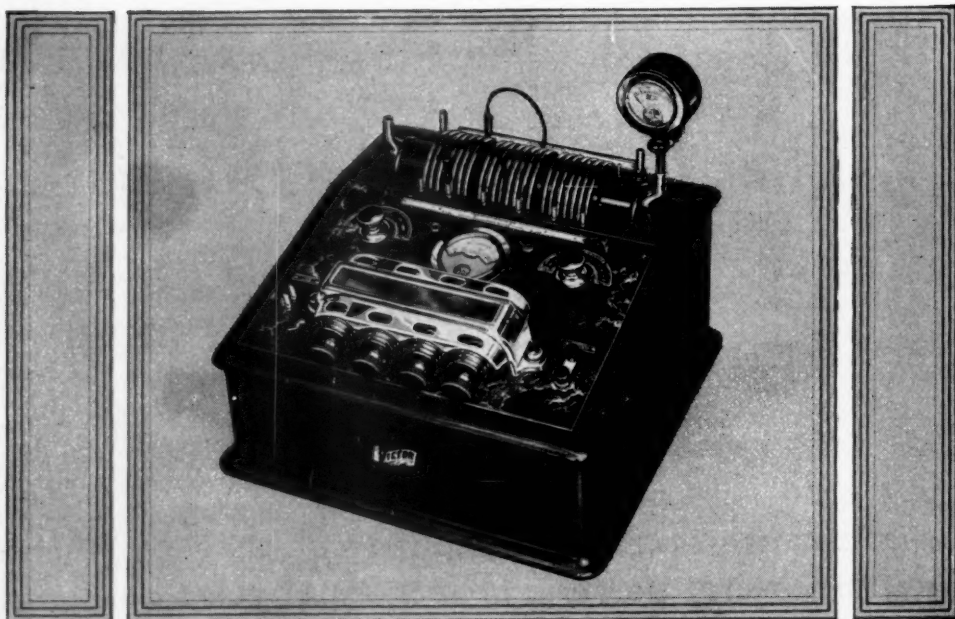
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ARCHIVES OF PHYSICAL THERAPY X-RAY, RADIUM

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PHYSICAL THERAPY INDICATIONS IN GYNECOLOGY*

JOSEPH E. G. WADDINGTON, M.D., C.M.
DETROIT, MICH.

Menstrual derangements of budding womanhood are frequently maltreated with some favorite but entirely inadequate prescription, accompanied with platitudinous advice as to rest and the probability that "time will eventually develop normal physiological adjustment." This medical *laissez faire* not only means an increasingly unsatisfactory relationship between the physician and his patient but conduces to consultation and treatment outside authorized medical circles and—finally, to the operating table.

Although I personally believe from clinical experience, supported by radiological examination, that constipation is a contributory cause and perpetuator of diseased conditions anatomically peculiar to woman, yet I find gynecological text books quite reticent as to its etiological significance. Graves in his 1929 edition, writes: "Probably the majority of women suffer either from constipation or diarrhoea at the menstrual period. The present theory is that these symptoms are due to a menotoxic action on the vegetative system of nerves. The theory is not only logical but it is fairly well substantiated by experimental evidence."

Considering the intimate anatomical and nervous relationship of the generative organs with the intestinal tract; the localized as well as generalized recurrent cyclic changes incident

to developing and developed womanhood; and recognizing the ubiquitousness of constipation before, during, and after menstrual activity, it should be equally logical to assume that constipation may exercise a deleterious or toxic action upon the vegetative system of nerves.

Therefore, a sinusoidal or wave current, interrupted at a rate not to exceed ten per minute is indispensably indicated in a majority of gynecological conditions. To overcome intra-abdominal congestion, by toning the splachnic vasomotor mechanism, one should apply the wave current by means of two small surface electrodes placed laterally to the seventh and eighth dorsal vertebrae. Atonic constipation requires the wave current applied directly over the spines of the first three lumbar vertebrae, with the other electrode contacting the sacrum. For spastic constipation, the intestinal reflex of dilatation will be elicited by concentrating the current over the eleventh dorsal vertebra. For obstinately chronic constipation, colonic flushing, expertly administered by means of a scientifically constructed colonic irrigator, is indicated as a convenient and satisfactory mechanical cleanser and direct conveyor of medicaments to the intestinal mucosa. Undue repetition of these irrigations, however, is injurious to the intestinal tract but, employed as a preliminary cleanser, or as a flexibly manipulative bougie or douche for determining and dispersing old fecal aggregations, and as a simple means of visually appraising the gross

*Read at the eighth annual meeting, American Congress of Physical Therapy, Chicago, Nov. 4, 1929.

character and degree of intestinal secretion and excretion, this hydrothermal procedure will materially expedite the benefits to be expected from physical therapy measures.

Retarded, irregular, painful and scanty menstruation may be beneficially treated with diathermy applied anteroposteriorly to the lower abdomen and, for speedy relief in dysmenorrhea, especially, cannot be equalled by any other agency. However, when functional impairment has progressed to organic derangement, the direct current will be preferably indicated. The negative pole applied over the abdomen, with a milliamperage raised to but not exceeding a comfortable sensation of warmth, induces a mild hyperemia and an electrochemical realignment of cellular elements: liquids, solids, and sometimes gases, conducive to physiological readjustment. The hyperemic or congestive factors underlying *menorrhagia* and *metrorrhagia*, as found both in the unmarried and also as a result of subinvolution sequent to the puerperium, call for the vasoconstrictive effect of the positive pole of the galvanic current applied directly over the lower abdomen. In extremely relaxed conditions of the uterus the positive electrode should be of mercury amalgamated copper, and of such size as to snugly fit into the uterine cavity. Current dosage may safely range from twenty-five to fifty milliamperes, dependent upon size of electrode, and administered for a maximum ten minute duration. With two small pad electrodes placed laterally to the first three lumbar vertebrae, the sinusoidal or wave current, interrupted fifteen to twenty times per minute for fifteen minutes, will be adjunctly indicted; or this may be valuably employed when there is no indication for intrauterine application. If deemed desirable, vaginal applications may be made with any of the low volt currents by means of a cotton covered carbon or aluminum electrode, the other or surface electrode being placed over the lower abdomen or over the first three lumbar vertebrae.

It is important to realize that, in addition to local treatment, the general or constitutional reaction of the patient quite frequently requires attention. Ultraviolet radiation will nearly always be useful for the pale, anemic sufferer.

The eradication of cervical erosions, ranging from the mild inflammations found in the unmarried to the seriously involved lesions sequent to a difficult and disabling confinement or severe infection, necessitates expert appraisal of the various available physical therapy measures to ensure expert results. As a cervicitis or an endocervicitis commonly accompanies the erosion, the former should receive initial attention. Intrauterine or intracervical ionization by means of a zinc or a mercury amalgamated copper electrode is usually indicated. If the erosion be not too extensive, both it and the cervical canal may be simultaneously ionized with the cone shaped electrode specially devised for that purpose. Where the erosive area is quite extensive, any copper or zinc electrode of convenient shape and size (hemorrhoidal or vaginal electrode) may be utilized, employing, very possibly, fifty milliamperes for a period of ten minutes.

For old, indurated and deeply eroded lesions, a diathermy current should be used as for eletrocoagulation but—with the needle held at a slight sparking distance from the tissues, this to conveniently limit the degree of tissue destruction. With this restriction of the spark and, consequently, the voltage, any cervical erosion may be rapidly but thoroughly destroyed with no occasion for any anesthetic. Nabothian cysts are effectually and simply disposed of by placing the point of the needle electrode against the cyst; the current switched on and the needle then gently pushed into the cyst and thus held for the minimum of time necessary to destroy the cyst wall; each cyst is thus in turn rapidly disposed of.

When the cervicitis, with the accompanying erosion, has developed to a sluggish chronicity, the tissues will need stimulant applications before the antiseptically indicated ionization or high frequency current can be expected to adequately accomplish its purpose. Insert any suitably sized intrauterine electrode up to but preferably not in direct electrical contact with the fundus, and connect to the negative pole of the direct current; apply possibly ten to twenty milliamperes for not to exceed ten minutes, and repeat at five to seven day intervals. Treatments

should be controlled so as not to induce excessively severe cramps incident to the evolution of hydrogen gas within the uterine cavity. Immediately following the intrauterine and intracervical applications—or alternately—connect the negative pole to a cylindroid metal electrode and apply slowly labile all over the erosive area, using from thirty to fifty milliamperes for ten or fifteen minutes. This invigorating electrochemical treatment, accompanied by the evolution of hydrogen gas, will appreciatively predispose the formerly indolently responsive tissues towards the sequently indicated antiseptic and vasomuscular constrictive measures.

In regard to the treatment of chronic endocervicitis and laceration of the cervix with the electric cautery, Fulkerson, in his 1929 Text Book of Gynecology, quotes Howard A. Kelly as follows: "It is my custom to do nothing else but insist on a prompt treatment and thorough cauterization of the whole exposed diseased surface of the swollen cervix, with its cysts and its everted mucosa pouring its secretions out from such glands as are not obstructed and cystic. This can often be done with from three to six linear cauterizing cuts well down into the disease, to be repeated in from four to six weeks at two or three intervals. With this procedure available, I but rarely operate any more for laceration of the cervix, for unless such a laceration is very deep, it needs no attention in the absence of any infection of the glands and when the infection is there the cauterization takes care of it perfectly."

Gonorrhea in the female and its treatment with diathermy still occasions much diverse controversy. If one will but recall the manifold and diverse treatments recommended for gonorrhea in the male and the apparently irreconcilable diverse results accruing therefrom, it should be easily apparent that each individual case of this prolific incitor of gynecologic disease is a law unto itself and that no stereotype procedure will prove adequate in a majority of cases. The Cumberbatch-Robinson technic of diathermy with a three-inch belt electrode around the pelvis and a small rod electrode in the cervix has become firmly entrenched at St. Bartholomew's as

the treatment par excellence for gonorrhea in the female, but—it is a method which requires much more skill than application of the electrodes, and the turning on of a certain quantity of a high frequency current. English machines are popularly of the high amperage low voltage type, and the average twelve hundred milliamperes therefrom delivered through a cervical electrode three-sixteenths of an inch in diameter and one and one-half inches in length is somewhat different, therapeutically considered, to the 300 or 400 milliamperes correspondingly deliverable from an American diathermy machine. Upon the least indication of painful or untoward pelvic reaction, the cervical treatment is at once discontinued and diathermy *mildly* applied against the cervix by means of a cylindroid vaginal electrode.

Pruritus vulvae and vaginae may often be complained of, especially after the menopause, with no objective signs of disturbed secretion; mild radiation with the water cooled mercury arc so physiologically overcomes the perverted nerve reaction of these sluggishly degenerating tissues as to not infrequently dispose of this intensely disturbing symptom.

Finally to be considered—though often initially—leukorrhea: that catarrhal symptom alike common to both the young and the middle aged. This symptom naturally will be satisfactorily relieved by correct treatment directed against the initial cause, and only rarely demands direct local treatment; however, when the vaginitis or catarrhal condition obstinately persists, direct ultraviolet radiation of the cervix and the vaginal mucosa will be indicated. A quartz combination ultraviolet and high frequency vaginal electrode will be stimulatingly effective in these relaxed, atonic conditions of the vaginal tract, employing a mild effluving discharge with an equally mild ultraviolet radiation. Ionization of the vaginal canal by means of a cotton covered carbon electrode moistened in a one per cent solution of zinc sulphate is sometimes beneficial.

CONCLUSIONS

There is an excess of highly trained surgical attention but a paucity of similarly high grade

medical skill directed towards the alleviation of gynecologic disease.

As a major portion of such conditions has its inception during puberty, being then mainly functional in character; and as such inceptive disturbances—as well as a considerable proportion of sequent pathology of not too advanced type—are satisfactorily amenable to indicated physical therapy, the general practitioner, pre-eminently, should be thoroughly conversant with the indications for and probabilities of such therapy as expertly applicable to those diseased conditions anatomically and physiologically peculiar to the female.

Scientifically practical treatment of disease, gynecological or otherwise, is only superlatively possible through physiological study of the living cell (colloids, crystalloids, and solvents) and a profound electrical conception of the atom.

DISCUSSION

Dr. H. D. HOLMAN (Mason City, Iowa): There isn't any subject that means more to the peace and serenity of the American home than the manner in which we take care of our gynecological cases. Medicine and surgery have developed a theory and practice that in the present day is very good. Physical therapy, however, in the present day acceptance, has lots of theory and a limited amount of practice that we can take to the profession at large.

It seems to me it is up to this organization to do something such as I understand the American College of Surgeons is doing. They have a committee appointed that is compiling all the information they can obtain on the subject of compensation work, and they expect to publish this for the benefit of the profession. It seems as though that is one of our duties.

We never should attempt to make physical therapy take the place of surgery and medicine; each has its place. To illustrate my point, I am going to give you two illustrations. Gynecology should be thoroughly considered from a diagnostic standpoint. If there is anything to repair surgically it ought to be repaired. The basis of gynecologic treatment depends on anatomic repair with reestablishment of a functional state.

It doesn't always take surgery, in my judgment, to make that anatomic repair. As an illustration, let me just cite a case. A young woman thirty years of age came to me. Seven years previously she had had double phlegmasia. She had been at Rochester and other places, but obtained no relief. She came to me saying, "Doctor, can't you give me some relief? I have so

much pain after I have been active for a while that I don't know what to 'do.'"

Her left side had completely recovered, but during afternoon she had difficulty in using the right leg. It was very difficult for her to go upstairs. My conception was that we had an anatomic interference.

I said to her that I thought perhaps I could give her relief by using diathermy. I applied diathermy to the right leg to improve her circulation. I treated that woman twenty-six times (that was five years ago) and her recovery was perfect; she dances, she goes upstairs; the pelvic function is normal. Everything is as it should be functionally.

The second illustration refers to the sine wave in constipation. A young woman came to me, suffering with symptoms of appendicitis. She gave a history of constipation. The appendix was removed. We had lots of trouble with the bowels subsequently.

About a year later her mother brought her in and stated that she was suffering from constipation so severe that ordinary medication gave no relief. I instituted the use of diathermy over the region of the appendix for the purpose of making more normal the circulation in that area. I obtained no results. I followed then with the sine wave. The mother sent me a note one day and said, "We will just discontinue the treatments. I can't stand any more of it." I had no difficulty to convince her to have her daughter continue with treatment and told her to disregard the matter of finances. I had a basal metabolism done, which was found to be low. I added thyroid extract to my treatment, and the recovery was perfect. She progressed very rapidly after adding the thyroid.

The point that I wish to make is that it is not always necessary to use the knife to correct an anatomical condition, and it is not always necessary to use physical therapy to bring about a normal functional condition, but to intelligently combine them. It is apparent therefore that a correct diagnosis is of first importance and then the use of correct measures.

Dr. V. SIMMONS (Shreveport, La.): Every doctor who has had any experience with gynecology at all has seen cases of erosion or ulcerated cervix. You may observe that it is probably twice as large as it ought to be; it is infiltrated and is bathed in a mucoserous or purulent fluid. The old method of treating that (I have done many of them) would be to amputate that cervix and all of you who have done that know the rest.

My treatment has changed in the past five years. I shall give you the method that I use in those cases. We know that those endocervical glands are diseased, that they are infiltrated and filled with a mucopurulent substance. To get to the bottom of those glands, you must penetrate deeply. I use a cutting knife and circle around the edge of the diseased portion, no matter how large it is, and cut down for about a half inch. The

electrode cuts like a hot knife in butter. You then take the cutting loop and scoop out just as deep as those diseased glands go, even if it is down to the inner cervix. If the cutting current is insufficient to stop bleeding, the coagulating current is used. As an anesthetic I use hyoscin-morphin-cactin (HMC), one or two ampules prior to operation. The last step is curetting away the coagulated material after a funnel-shaped opening has been made to replace the cervical canal. The patient is kept under observation for about six weeks and then discharged. I have found this to be the superior method.

DR. H. CARLSON (Chicago): I should like to ask the last speaker if he made a biopsy of the specimen taken out or had any pathological examination made of those tissues to determine whether it was malignant or nonmalignant in cases of women at the menopause age.

DR. SIMMONS: In that case I curet the womb thoroughly and of course have the scrapings examined.

Here is an idea that I got from Dr. Willmoth some two or three years ago in a paper that he presented before this society about treating cancers of the womb with the diathermic current. I have had a case of a woman weighing some three hundred pounds, with diabetes, and you know a case like that is not a good risk for surgical operation. I curetted that womb and the laboratory returned a diagnosis of cancer. I sent a friend of mine, who is a surgeon in Shreveport, to examine the case and give an opinion about extirpation of that womb. He did so and said, "It won't do; she won't stand an operation."

I had a large electrode made that filled the caliber of that womb. I used a bifurcation diathermy method in treating this case and I gave her about three hundred milliamperes from the diathermy machine for about ten minutes, or in other words, just as much as she could possibly stand. I scraped that womb in about four weeks' time, sent it to the laboratory under a different name, and the laboratory reported back to me non-cancerous. Following that treatment, the womb returned to practically normal size. That occurred eight months ago and the patient is still in good condition. That was a surprise to me.

DR. A. D. WILLMOTH (Louisville, Ky.): The indications for physical therapy in gynecology, as was well stressed by one of the speakers, depends entirely upon a correct diagnosis. Nothing can be more detrimental to a case than to treat a patient who has a clearly oper-

able condition by some method of physical therapy. On the other hand, many conditions that we formerly thought were operable can be relieved. The entire question hinges on a correct diagnosis.

If I understood correctly, one of the speakers said that he had not removed a tube in five years. I don't see how, if you are going to treat all cases with physical therapy. I have been an abdominal surgeon for thirty years and I want to say that when you find adhesions that are so tough that you can't separate them with the end of your finger and a piece of gauze, and have to use a pair of scissors, to talk about relieving them with galvanic current or any other current is perfectly ridiculous in my mind. I have tried it and I want to say that you can't do it. You can't do it with your finger, and if you can't do it with your finger how are you going to do it with something else? You may give the patient relief but the adhesions are there just the same. If you don't think they are, open the belly and look inside and you will see.

I know of no field of work where physical energies will give you such splendid results as in gynecology. Under the instruction of the late Dr. Massey I began many years ago to use the galvanic current and other measures as they were developed and given to us. I soon learned that I could manipulate a galvanic current and achieve results much faster and better than by topical applications of current drugs. In eroded cervixes, the desiccating effect on the lesion is definite and effective. Nabothian glands, cysts and small neoplasms yield to electrosurgery in a most spectacular manner. Naturally, the best results are obtained by the physician who is well acquainted with the instruments and who has an understanding of the condition that he is about to treat. There is no royal road to an understanding of physical therapy. It requires study and experience.

DR. JOSEPH E. G. WADDINGTON: All the discussants have agreed that diagnosis is of prime importance. Dr. Willmoth sounded a note of conservatism. One cannot be too conservative when the subject of discussion is physical therapy. That a proper diagnosis is essential is obvious, but nevertheless should be emphasized. In spite of the most intelligent use of these measures it must not be forgotten that it is but an adjuvant and that failures are likely to be encountered. These failures can be explained on the basis of difficult diagnosis, poor cooperation on the part of the patient or a misinterpretation of symptoms. In the majority of instances the results achieved have frequently bordered on the spectacular.

FURTHER OBSERVATIONS ON DIATHERMY IN PNEUMONIA*

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Now that diathermy has come into its own as a proven and accepted aid in the treatment of pneumonic conditions, it is incumbent upon us as physicians to not merely accept and use it empirically, but to endeavor to place diathermy, and incidentally general therapeutics, on a still higher plane. This can be accomplished by greater refinements in technic which will reduce the present high mortality rate, and make physical therapy measures more successful in the hands of those who only occasionally have opportunity to prescribe or administer them.

The use of diathermy is only an instrumentality to an end. To make the unqualified statement that its administration is beneficial in pneumonia is only to state a half-truth. It is just as much of a partial truth as to make the blunt statement that the procedure of appendectomy is all-sufficient in appendicitis. The latter statement would cover a simple early acute catarrhal appendicitis, but would not suffice in the case of a suppurative ruptured appendix where the introduction of ample drainage is possibly a more important item of the technic than the excision of the appendix.

Likewise, in employing diathermy in the broad field of pathology covered by the term pneumonia, the placing of two electrodes to the chest and application of a high frequency current of a certain amperage for a definite period of time will not in all cases and in all stages produce the best results possible with diathermy. To make any worth-while statements about diathermy technic in pneumonia, it is first necessary to have an intimate conception of the pathological and physiological processes that have taken place or are at the time in progress. Your

indulgence is invoked while a few commonly accepted facts are reviewed regarding pathology in pneumonic conditions.

It has long been established that lobar pneumonia is an acute, infectious, self-limited disease, tending to recovery. It is primarily a local infection striving to become general. Usually one of the four groups of pneumococcus is the etiological factor, but in addition the streptococcus, or the influenzal bacillus, may be present. It usually produces death by cardiovascular failure, induced by anoxemia, toxemia, and right cardiac overstrain. The latter is due to pathological changes in the lungs and myocardial changes resulting from the toxemia and anoxemia just mentioned. With some, the toxic substance elaborated is hemolytic and has the power of converting hemoglobin into methemoglobin, so that the blood, even though an abundance of oxygen is available, cannot absorb and utilize it, and the blood therefore is markedly deficient in oxyhemoglobin.

The anatomical changes in lobar pneumonia are commonly divided into four stages named for the predominating characteristic present at that time. It should be remembered, though, that the transition from one stage to the next is usually not abrupt and that a blending of two or more stages may be present at the same time. In the first stage, the so-called stage of engorgement, the capillaries of the alveolar walls are dilated with blood, and there *exudes* into the air-cells fluid from the blood, together with leukocytes and red corpuscles. The second stage, which is the earliest one commonly seen at autopsy, is called the stage of red hepatization, on account of the resemblance to liver. The abundant inflammatory exudate has clotted and fills the alveoli. Sections show these firm, dry clots to be composed of a coarse-meshed network

*Read at the eighth annual meeting, American Congress of Physical Therapy, Chicago, Nov. 4, 1929.

of fibrin in which are entangled *numerous pneumococci*, red corpuscles, many polymorphonuclear leukocytes, and some desquamated epithelial cells. MacCallum¹ believes that perhaps the most distinctive thing about the exudate from the microscopical point of view is its freshness and good state of preservation. The red cells are intact and stand out clearly with their normal hemoglobin content; in other words, they show as yet no sign of laking or hemolysis. The leukocytes are clearly outlined, contain several pneumococci, and show active phagocytosis. In the third stage, that of gray hepatization, sections show the alveoli to be densely packed with a cellular exudate plus increased numbers of bacteria and leukocytes. Red corpuscles are hardly to be found except in a disintegrated state. Capillaries are often plugged with fibrin and huge cellular masses. Cellular degeneration seems to be the distinctive feature microscopically. In a later stage, that of resolution, the alveolar contents have lost to a great extent their appearance of being in the form of plugs, and the whole lung appears gray and jelly-like. Through the agency of the proteolytic ferments of the leukocytes themselves, the whole mass of exudates is liquefied in a few days, and, while some of it is expectorated, the greater quantity is absorbed by the lymphatics and carried away.

It is remarkable how little actual involvement of the lung tissue itself there is in lobar pneumonia, in contra-distinction to what usually occurs in lobular or bronchopneumonia. In lobar pneumonia it is largely an exudative affair. The entire process seems to occur in the lining of the alveolar spaces and bronchi and involves only the superficial epithelium of the air-sacs and the associated bronchioles. This fact favors complete and prompt restoration of the lung after inflammation has subsided, and the occluding mass of fibrin-imprisoned cellular detritus has been removed. It also explains why a septicemia is less likely to occur in ordinary pneumococcal lobar pneumonia than in pneumonia of the bronchial or influenzal type where not only the lining epithelial cells are affected but also the deeper structures. It is upon this important difference in pathology that the writer bases his

belief that different technic should prevail in the two types of invasion and in the different stages of the lobar type.

A description of the pathological changes which are found in influenza is difficult to give because of the complications, combinations, and variations arising from differences in the stages of the disease. It should constantly be kept in mind that there is nearly always more than one organism at work in practically all cases in which serious pulmonary complications occur. The usual course of events is as follows:²

- (1) Primary upper respiratory tract infection by the influenza bacillus.
- (2) Secondary invasion of the inflamed bronchi by pneumococci, producing a broncho- or a lobarpneumonia.
- (3) Tertiary invasion by hemolytic- or non-hemolytic streptococci which infest the pneumonic area.

In some cases the streptococci are the secondary invaders, the pneumococci being absent. Other cases show the staphylococcus or Friedlander's bacillus to be the secondary invader; or the influenza bacillus may dominate completely and by extension into pulmonary tissue may produce the pneumonia.

Not content with the production of an intensely inflamed mucous membrane in the bronchi, the influenza bacillus penetrates still further, passing through the wall and invading the interstitial tissues as well, producing various degrees of softening and necrosis. This bronchial wall softening frequently tends to dilatation and accounts for the fact that the influenza bacillus is the most constant factor in the production of bronchiectasis. Often this interstitial influenzal bronchopneumonia invasion resembles shot-like tubercles. Frequently there is very little consolidation, which accounts for lack of physical findings. X-ray examination shows central hilus involvement, spreading peripherally, but seldom extending into the apices. Costophrenic angles are also generally clear, unless fluid forms to obliterate them.³

With this picture before us let us visualize what is likely to occur if much diathermy heat is passed directly through the involved area, remembering that we are dealing with the infiltrative type of disease and not with the exudative. Obviously, the greatest danger would be the possible production of general septicemia by putting too much heat through multiple miliary abscesses or potential abscesses, as Norris and Landis so aptly term them,⁴ and producing not only increased absorption of toxins elaborated therein, but also favoring entrance of organisms into the blood stream. In lobar pneumonia, where the subepithelial tissues are not invaded, the latter disaster is not so likely to result; but in bronchopneumonia and the acute hemorrhagic pneumonitis of influenzal origin it is a real danger except at the onset of the disease. It is the writer's opinion that the possible beneficial effects of diathermy in furthering enzymic liberation are decidedly offset under these conditions by the possibilities of initiating or promoting general septicemia.

This belief has led him to refrain from the temptation to use diathermy through the affected region in these very toxic late cases, applying it, instead, through the relatively uninvolved opposite lung, if unilateral, or, in desperately toxic patients, through some more remote body area, to secure the probable benefits of diathermy in promoting the elaboration of bactericidal enzymes developed by the leukocytes. He has also employed it in the form of so-called Tesla autocondensation for the same detoxifying effects. There is added to these the decongesting and sedative effects of infra-red radiations to the chest for about thirty minute periods at frequent intervals. Abundant fluid intake is also an essential. The treatment outlined above has resulted in the recovery of several apparently moribund cases which experience has indicated would probably have died had diathermy been applied intensively and routinely through the involved lung.

In estimating the impairment of lung function in pneumonia it is important to consider what part the probable existing pathology plays in the interference with adequate diffusion of

oxygen through the lung with consequent deprivation of oxygen to the tissues. The dangerous and distressing symptoms of subjective discomfort, increased dyspnea, rising pulse and respiration, together with cyanosis, are familiar pictures to us all and illustrate the need of oxygen absorption in the form of oxyhemoglobin to supplant the anoxemia produced by the formation of methemoglobin, said to be caused by the soluble toxic substances of the pneumococcus.⁵ It has been definitely established that, with few exceptions, the dyspnea, anoxemia, and toxemia of lobar pneumonia are usually out of proportion to the extent of alveolar involvement, and are not the results of so much of the lung tissue being put out of commission that it is mechanically or physically impossible to produce sufficient aeration, but that these symptoms are due to biochemical changes in the blood produced by toxins, which form the relatively chemically fast and nonabsorbable methemoglobin, thereby locking up the hemoglobin so that the oxygen-transporting oxyhemoglobin cannot be formed or function.

It has long been the dream of serologists to prepare a practical concentrated serum by which it would be possible to successfully neutralize the toxic substances of pneumonia, prevent the formation of methemoglobin, and thereby relieve the anoxemia and toxemia. This would place pneumonia as definitely under our control as is diphtheria and is an ideal which we earnestly hope will soon be attained. The principal obstacle to its realization is to produce an effective biologic preparation of sufficient concentration so that injection of such large quantities will not be necessary. At present serum reactions are reported as being far too numerous even with the improved antiserum of Cole, especially effective against type I, much less so in types II and III, and slightly better in type IV. Huntton's preparation of specific antibodies, chiefly effective in type I, does not seem to carry the danger of serum reactions; but since it is given intravenously, it often produces severe, general reactions. Further discouraging factors are the very limited supply and high cost of these concentrated biologic preparations, and the necessity for expert laboratory facilities to determine

"types." Also the published mortality of twenty to twenty-nine per cent is apparently higher than that reported with diathermy.^{6 7}

No well-balanced physical therapist, no matter how enthusiastic, will claim any specificity in pneumonia for diathermy *per se*. However, it is well known that all chemical processes are increased at an optimal temperature range, and it is probably not claiming too much, in the face of recent investigations, to state that properly applied diathermy does assist, possibly by the heat it supplies and possibly by its frequency oscillations, or both, in producing conditions more ideal for the body itself to produce and liberate its own antibodies and thereby curb the infection.⁷ The symptomatic relief, evidenced by the commonly noted improvement in color, deeper respiration, steadier pulse, lessened respiratory grunt, diminished pain, and refreshing sleep, would seem to justify this belief. Until an ideal biologic method has been perfected and is more generally available, diathermy will continue to be its best substitute.

The marked benefit of diathermy in the early stage of pneumonia has been vividly described by Clement.⁶ He summarizes his experiences so concisely that it is well worth repeating. He states: "The physiological action of diathermy on inflammatory areas is that of hyperemia in its most efficient form; bactericidal, absorbant, dissolvant, decongestant, analgesic, and nutrient." He further states that "In lobar pneumonia the physiological action of diathermy maintains the stage of congestion, prevents the morbid process from progressing to the stage of red hepatization or gray hepatization and afterwards relieves the congestion." We have often made the same observation in connection with most of the early cases handled by our department. In fact, the results have been so uniformly good in the early cases that we have about decided upon taking x-ray films routinely in order to prove to our critics that the patients really did have developing pneumonia.

It has been the writer's experience that during the stage of congestion diathermy gives best results when applied intensely and at frequent

intervals, two to four times daily, using a current of high heat quality for periods of thirty to forty-five minutes, with large electrodes covering the chest, placed anteroposteriorly. Under this use of general chest diathermy the impending pneumonia literally melts away and the lungs promptly clear up and the fever disappears. We noted this apparently aborted pneumonia in twenty of such cases in student nurses who were stricken during the epidemic of last winter. At the first suspicion of an attack of pneumonia the nurses were put to bed, x-ray films taken to confirm diagnosis, and diathermy routinely and intensely applied as mentioned above. Not a single case of the group went on and developed frank consolidation, although it was evident from symptoms, and physical and x-ray findings that pneumonia was imminent.

By thus applying diathermy intensely during pulmonary congestion the lymph channels and capillaries surrounding the inflammatory area are dilated, vasomotor function normalized, stasis is removed, the blood flow gradually reaches equilibrium, extravasation into surrounding tissues ceases, and edema subsides and carries soluble toxins away with it to be destroyed.

Drug medication and oxygen administration do not come within the scope of this paper, but lest I be misunderstood, I will here most emphatically state that I am a firm believer in the value of digitalis and oxygen when understandingly and efficiently administered. There is no contra-indication for their use in conjunction with diathermy, nor does diathermy and other physical measures mentioned interfere in any way with their employment. Since we have no specific in this disease, I advocate and practice the use, when indicated, of those measures—biological, pharmaceutical, and physical—which offer the patient most in the way of comfort, speedy progress, and prospect of complete recovery. But all drugs possess depressant effects as well as virtues, consequently their value may often be offset by their after-effects and toxic properties. I am convinced that diathermy will often relieve pain in pneumonia as thoroughly as morphine, and will frequently restore cardiac and circulatory balance more quickly than digi-

talis, thus promoting oxygenation through a combination of the two foregoing virtues, often relieving one of the necessity of administering oxygen. Its early and frequent use will usually make other medication unnecessary. Furthermore, its skillful use can do no harm.

SUMMARY

As has been stated before, no cut and dried technic, applicable to all cases of pneumonia, can be offered in safety, due to variations in pathology, but there is presented below a brief outline of the factors which experience has shown may serve to determine the technic:

During the stage of congestion, diathermy can with safety be given rather frequently, boldly, and in massive concentration through and around the affected area. During the early part of the so-called stage of red hepatization it may also be given in fairly massive doses through the usually more or less edematous opposite lung. During the stage of gray hepatization and early resolution, when toxic absorption is a real danger, the affected bacteria- and pus-laden area should be carefully avoided and diathermy directed cautiously toward any outlying edema in relatively unaffected lobes and by a special technic as a myocardial stimulant.

During delayed resolution it may again be directed to the affected area, to be diminished in intensity or perhaps discontinued, should symptoms of toxic absorption appear. Here quartz light radiations for their tonic and detoxifying effect will be a material aid.

In using or prescribing diathermy in pneumonia, several things must be kept in mind. It

is a remedy that probably requires more skill for its successful employment than does the giving of digitalis. The type of pneumonia, the stage of disease, and the pathology present, are all important factors in determining the site of application and technic of administration. Unskillful application may cause a patient to be poisoned in his own by-products or may promote a general septicemia. There are times when intensive diathermy directly through the involved area would be virtually homicidal, whereas, given through the opposite lung, or even through a more remote part of the body, and combined with other forms of physical therapy, it is of distinct benefit and a life-saving procedure. To secure best results its use requires close and skillful supervision with the ever-changing pathology constantly in mind.

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DIATHERMY AND OTHER PHYSICAL AGENTS IN THE TREATMENT OF PNEUMONIA AND ITS SEQUELAE*

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A careful study of the pathology of inflammation in general and of the "natural pathological history" of the pneumonic process in particular, permits conclusions as to the general therapeutic approach by means of physical therapy.

Let us consider in general what happens "normally" in the inflammatory process of the lungs termed "Pneumonia." The capillaries in the alveolar walls of the affected area are dilated with blood and there exudes into the air cells fluid from the blood together with the leukocytes and red corpuscles. Desquamation of the epithelium takes place and at the stage when hepatization is reached, an abundant inflammatory exudate is found to have filled the alveoli and to have clotted. The area affected is almost completely airless, the circulation of the blood and lymph is reduced to a minimum, elimination and nutrition are to a marked degree impaired, toxins flood the blood and the "Pneumonia" is fully developed. These conditions apply to a certain degree to all forms of "Pneumonia:" the difference lies more or less in the extent and intensity of involvement and the degree of toxicity of the causing agent.

At the stage of resolution, a softening of the infiltrate with disintegration of the fibrin and leukocytes as well as the other formed elements takes place through the proteolytic action of ferments; part of the softened exudate is expectorated, and the rest, after complete liquefaction, is absorbed by lymphatics.

The further process of healing consists of the clearing up of the pathological residue, partly by phagocytic action, and the lining of the alveoli is restored to normal function. In short, the local pathology consists of exudation into the alveoli, solidification of the exudate, a mechan-

ical compression of the alveolar septa and, of course, of the blood and lymph-vessels within the septa.

There is also a vascular paralysis, toxic in nature. The systemic pathology, with all the clinical features of fever and general nervous and cardiovascular disturbances, is of toxic origin.

The physical therapeutic approach in an inflammation in general can be either with the view of trying to check the development of the inflammation, or, if this is impossible, of speeding up the cyclus of the process; that is, bringing the inflammation to "a head" by means of heat.

Let us consider the main phenomena that take place in living tissue when physiologically bearable heat is applied. In the heated area an active hyperemia sets in with an acceleration of the local metabolic processes, meaning increased combustion and elimination (lymphatic mobilization).

The usual termination of an inflammation that has not been absorbed before it has reached the climax is liquefaction through the proteolytic action of enzymes formed within the inflamed area.

From laboratory experiments we know the role that heat plays in the course of the action of enzymes: low temperatures retard, biologically bearable maximal temperatures accelerate the process.

The ancients knew that in an external inflammation the application of cold and heat plays a certain role, especially the latter; and when we consider all the forms of poultices and cataplasms commonly used in former days, we

realize how much and why they have been in vogue. But it is only with the advent of diathermy, which offers the possibility of placing heat at any desirable depth of the body, that we were able to attempt, with any promise of success, the treatment of pneumonia by the application of heat.

What is the accomplishment of diathermy in pneumonia? The local effect is an active hyperemia, softening of the infiltration by the physical action of heat, as well as a biological influence upon the enzymes, lymphatic mobilization, improved local nutrition. The systemic effect is intensive perspiration which is a form of elimination *par excellence*, bringing as a result of this a cardiovascular and renal relief.

The influence of diathermy upon the clinical picture is very marked locally as well as generally. The quality of the color and pulse is improved. There is a deeper respiration due to the relief of pain (pleural relief), the cough becomes softer, general relaxation takes place and the patient appears less toxic.

Over the affected area, on auscultation, a marked change is often noticeable even after one or two applications of diathermy. In the area of dullness over which on auscultation very rare crackles and rales could be heard before the treatment, a marked increase of moist rales is noticeable, so that it appears that a considerable change in the fluid content of the affected area takes place during and immediately after the application of diathermy.

To draw a conclusion as to the minute biological changes within the affected area in the sense of mobilization of the proteolytic action, would be too soon—considering that experimental data to that effect are lacking. But the knowledge of the action of heat upon the course of inflammation in the physical and biological sense suggests this conclusion as very probable.

A number of questions come to the foreground when we speak of the therapeutic action of an agent. One of the questions that arise in discussing pneumonia is: Is there any difference,

as far as the influence of diathermy upon a pneumonic process is concerned, whether the case to be treated is clinically a bronchopneumonia, lobar pneumonia or an influenza pneumonia? As far as our experience goes, we couldn't notice an marked difference in the outcome, nor could we see any difference in the influence of diathermy upon lobar pneumonia with regard to the "type" of pneumococcus which was the causing agent. The only type of pneumonia which did not seem to be affected by diathermy was the "aspiration pneumonia." (Only two cases came under observation: one was a pneumonia following a paralytic stroke, and the other was a young individual after a tonsil operation with general anesthesia.)

Another question worth while discussing is: How much influence has diathermy upon the duration of the disease? In a patient who was treated with diathermy from the beginning of the acute stage, this stage seemed to be shortened considerably as far as the duration of the very severe manifestation of the illness was concerned. But with regard to the general duration of the disease, the question cannot be answered as there is no infallible measure of duration of pneumonia at our disposal.

Regarding the prevention of complications such as unresolved pneumonia, formation of abscess, pleural exudation and empyema, bronchiectasis and chronic bronchitis, we can say without hesitation that in none of the cases that received diathermy from the beginning, have complications of the above-mentioned type been noticed.

The crucial point of our discussion is reached when we touch upon the question of the mortality rate. The mortality rate of pneumonia in general is a variable quantity depending upon age, social status, season, infecting agent, epidemiological factors, etc. Regarding our statistics, we would like to emphasize the fact that out of over one hundred cases treated with diathermy in the last six years, most of them have been taken care of in their homes with average medical and nursing care. Their ages ranged from fourteen to seventy, and they belonged to

the various social and racial groups of our community with the exception of colored. Only a few have been hospital cases, and these have received diathermy only when their condition was very critical.

The mortality rate of the ones treated at home with diathermy was almost *nil*. It should be emphasized that none of the usual medical procedures was neglected regarding general care, medication, etc. Of the ones treated in the hospital, some have shown an almost dramatic change, but the material as well as the circumstances under which they have been treated do not permit any definite conclusion. It remains a task of the future to investigate more closely the influence of diathermy upon the mortality rate of pneumonia in hospital cases. Our experience suggests that such an investigation might prove worth while and fruitful.

The indications as to the advisability of using diathermy in pneumonia are shown in the aforementioned analyses. We turned to diathermy when the symptoms were alarming from the beginning or when we found, in the course of the disease, very high temperature, extremely rapid pulse, cyanosis, high respiration rate, shallow breathing, unproductive cough.

Very frequently such an alarming case will show an entire change in the clinical picture after being treated with diathermy; the cyanosis lessens, the quality of the pulse improves, deeper respiration takes place, pulse rate decreases, the cough becomes more productive. In some cases where auricular fibrillation appears, diathermy will frequently bring about a change to a normal rhythm in a relatively short time. As for contra-indications—with proper technic there are very few—they are: complications of pneumonia (1) empyema, (2) closed lung abscess, (3) decompensated heart.

The technic in acute pneumonia is as follows: We take two metal electrodes which are prepared in the usual manner, the active electrode being selected according to the approximate size of the involved area, the indifferent electrode being about one and a half times to

twice the size of the active one. They are placed on the chest opposite one another so that an imaginary axis passes through their centers in the same plane. They are placed either laterally or anteroposteriorly with the understanding that the active electrode is to be near the involved area. The plates are held in place by a rubberless bandage or, alternatively, by a towel which is well fitted to the chest to keep the plates in place.

The treatment is given for about thirty to forty minutes and repeated two or three times within twenty-four hours, care being taken not to disturb the patient very much. Regarding the milliamperage, we have been using between 60 and 70 milliamperes per square inch of the active electrode. Toward the end of the treatment we noticed in almost all cases, if the above rules have been kept, the patients started to perspire profusely.

To encourage the perspiration, which in our opinion is extremely beneficial, we made it a practice to cover the patient well at the conclusion of the treatment, the plates being removed while the patient was covered. About half an hour after the conclusion of the treatment, a dry rub was found to be invigorating and comforting to the patient.

A slight variation in the milliamperage was found to be necessary if the weight and general skin condition of the patient was above or below the average.

The frequent sequelae of an abnormal resolution of some forms of pneumonia are: unresolved pneumonia with chronic pneumonitis, asthmatic bronchitis, bronchiectasis, and, especially after influenza, pulmonary abscess. Of the above-mentioned sequelae, the influence of diathermy is most noticeable in unresolved pneumonia and in chronic pneumonitis. In unresolved pneumonia we can follow up roentgenologically the improvement—the clearing up of the dense shadows and the mottling in the affected area. The clinical improvement in these conditions is noticeable after prolonged diathermy treatment by the clearer percussion and

breath sounds, decreased pectoral fremitus and clearing up of the bronchitic and moist rales.

Unresolved pneumonia and pneumonitis are known to be often the causative factor of chronic bronchitis, asthmatic bronchitis and bronchiectasis. Of these conditions, chronic bronchitis and asthmatic bronchitis are most amenable to treatment with diathermy and the results are fairly encouraging. But diathermy alone is not sufficient to bring about a cure. Patients affected with postpneumonic, asthmatic bronchitis and chronic bronchitis frequently develop a hypersensitivity to "cold," and a cure can be expected in a large proportion of patients if the local treatment by diathermy is followed by systematic and prolonged treatment with ultraviolet light and a polyvalent vaccine (influenza-catarrhalis vaccine). This treatment has often to be repeated for a few fall seasons in succession to insure permanent results.

Of the other sequelae, it is well worth mentioning that the least result is to be expected in bronchiectasis, and hardly any in pulmonary abscess.

There are various physical agents useful in the treatment of pneumonia in the acute stage as well as in convalescence. When the temperature is very high and the patient is delirious, the respiration shallow and the skin very dry, a carefully applied Priesnitz compress to the chest can influence the depth of breathing, and very often a certain degree of perspiration can be brought about which is surely a gain in the sense of elimination.

When the patient is seized by chills, especially at the onset of pneumonia, the application of heat in the form of thermophors, radiant heat, infra-red, hot water bags, etc., will prove very comforting. In severe dyspnoea at the height of the disease, the oxygen tent might prove of great value.

Another physical agent, namely, fresh air, can be of value to a patient suffering from pneumonia during the warm seasons, but it can and does bear disastrous results during the cold and humid months of the year. It has been our ex-

perience that most of the patients who had complications in pneumonia have been the ones who have had the misfortune to be treated during the cold and humid season "with plenty of fresh open air." As far as "open-air treatment" is concerned, there seems to be a hopeless misunderstanding, apparently because the text books of internal medicine do not emphasize sufficiently the physiological cause of dyspnoea in pneumonia. The dyspnoea is not due to lack of oxygen in the surrounding air. It is due mainly to the inability of the respiratory organs to utilize the oxygen, and still more due to the toxic condition of the central nervous system.

We want further to emphasize the fact that in pneumonia, as in many other acute diseases, the automatic regulation of heat in the body is disturbed, and any kind of chilling of the skin, especially if the skin is moist, will bring about a disturbance of the internal organs.

Another argument against the extravagance of "wide-open windows" is the fact that chilly air hampers perspiration which is a safety valve for elimination (relieving the cardio-renal system). The high mortality rate and the frequency of complications in pneumonia ought to be a sufficient warning against the indiscriminate use of "fresh air." The "open-air" treatment" idea is badly in need of a careful revision.

Of other agents worth while mentioning in the treatment of pneumonia, we would like to point to infra-red light and the actinic rays. The infra-red light is very useful in relieving the often unbearable pain of pleural irritation during the acute stage as well as in the postpneumonic period.

The time for using actinic rays is in the period of convalescence, whether it is a plain or a complicated postpneumonic condition. During the acute stage, the use of Alpine light is inadvisable on account of its biological action upon the peripheral cells which are overstimulated by the toxins.

CONCLUSIONS

In diathermy we have a valuable weapon to fight pneumonia. The action of diathermy

seems to be based on the physical action of heat upon the metabolic processes as well as upon the action of enzymes.

Diathermy is not the only therapeutic agent to rely upon. General medical care is always of high importance.

Diathermy, with proper technic, is indicated in all forms of pneumonia except in aspiration pneumonia, and in pneumonic complications (closed empyema, pulmonary abscess and decompensated heart).

Diathermy treatment has proved a good prophylaxis against complications, and appears to be of value in treating some of the post-pneumonic complications (unresolved pneumonia, asthmatic bronchitis, chronic bronchitis).

Open-air treatment is based on a physiological misunderstanding, and needs revision.

There are other physical agents useful in the treatment of pneumonia in the acute stage, namely, heat and cold in the form of thermophors, radiant light and heat, and cold compresses with proper indications.

Good judgment is just as important in the use of physical therapy as in any other field of general medicine.

DISCUSSION ON THE PAPERS OF DR. FREELAND AND DR. LILIENS

DR. LUTHER A. TARBELL (Battle Creek, Mich.): It is a very risky business to draw general conclusions in pneumonia because we all know that we may not have the same type of infection where apparently the bacteriology is the same. There is a great difference in the virility of different epidemics in which the infection is apparently the same. It is affected not only by this, but also it is more virulent at certain times of the year. That may possibly be due to a lessened resistance within ourselves.

Although I agree with Dr. Freeland in his general statements, I wish to take exception to one point, and that is the avoidance of treatment of pus-laden areas, as he called them. Personally, I have had my best success, as I have already stated, by concentrating very heavily on the areas in which we have our infection. For instance, if the infection is a right lower lobe, I

certainly would concentrate my treatment on that particular area very hard. If it is a central bronchial pneumonia, the same method would hold. I would concentrate upon that area and would give treatment there as intensely as possible. I have not been so unfortunate as to get into any trouble by so doing. As I have already stated, in some cases we have successfully treated empyema following pneumonia and lung abscesses by this same technic. If you inadequately or infrequently treat those cases, then your symptoms of toxemia will be greatly increased.

In regard to the second paper: I think the results obtained by Dr. Lilien were very much the same as mine, although I would not make an exception as he did in the case of inspiratory pneumonia. Of course, that is a more difficult thing to deal with, and I think it depends a great deal upon the inspired material taken in.

The essayist seems to think where it is of the influenza type, there should be some difference in the technic. I believe in those cases they oftentimes require more concentrated treatment. I think the general medical care in those cases has to be given a little more attention, if possible, than in some of the other cases.

With reference to the matter of fresh air, I think it can be overdone. We have some patients who develop pneumonia due to the fact that they have been over-exposed. Do not chill the patient when his resistance is lowered by some infection. I firmly believe in the adequate administration of fresh air in some form or other in all cases of pneumonia, especially where there is insufficient oxygenation. A very efficient way to administer oxygen is by means of the oxygen tent, preferably using the oxygen tent which makes use of the ice-cooled air, to which oxygen has been added, and from which the CO_2 has been taken out.

Infra-red radiation has a certain value in relieving pain, especially pain in the pleura; but you can accomplish even more by the use of diathermy. I agree with the speaker in regard to the use of actinic light; in fact anything which you can do medically or physically to add to the general welfare and comfort of the patient should be utilized.

DR. G. A. EHRET (Cleveland, Ohio): One of the reasons that brought me to this meeting was to find some measure that might be beneficial for bronchiectasis following pneumonia. I have had such complications following pneumonia. If there is anything that is troublesome for a long time, it is bronchiectasis.

I should like to ask Dr. Lilien if there is anything that can be done to quickly relieve this condition. Our medical books advocate hygienic fresh air treatment, but in my forty years experience I have been unable to find anything for the relief of bronchiectasis until I began using diathermy. That may seem strange. We

know that diathermy is fine in fibrosis, but we have an opposite condition in bronchiectasis, have we not?

DR. J. S. HIBBEN (Pasadena, Calif.): As clinical reports both of these papers have great merit. They represent experience, observations and conclusions drawn from the bedside. In substance they offer valuable confirmation of the usefulness of diathermy in pneumonia and some of its complications. Both of the papers have been unusually explicit in regard to their impressions of the action of diathermy. Usually there is absence of detail. Heretofore, if I should have attempted to repeat the work of some of the published reports I would have been stopped in the very beginning because of the presence of too much generalization and the lack of detail. In the present instance both papers have furnished sound, logical reasons for the administration of diathermy. Dr. Lilien has been unusually clear in his reasoning, and in his technic. The indications and contra-indications were enumerated, the dosage, and intensity of current was stated, the number of treatments and the follow-up method was mentioned. One could visualize the treatment and one could repeat it without confusion. The dosage is an important factor and equally so is its method of administration. Until all diathermy units have been standardized by the Council on Physical Therapy, essayists should inform us as to the make of the machine, its size, its capacity, its frequency, the size of electrodes utilized, the areas treated, the time of treatment, that is, its length, the number of treatments per day; the reaction of the patient, and the changes of the physical findings following each treatment. We need greater precision and more detail in the present state of physical therapeutics. These two papers represent contributions above the average.

DR. H. B. GARDNER (Pittsburgh, Pa.): The first stage of pneumonia is a very active hyperemia or congestion. I want to ask if it is proper to prolong it, whether the first stage should be prolonged or not. That is what you are doing, as I understand it.

DR. R. W. FOUTS (Omaha, Neb.): The treatment of pneumonia by diathermy is empirical, and so far as I know has remained so. We have not as yet been able to determine just what happens in a biological way or what effect is produced upon the involved lung. However, from a clinical standpoint there is no question that there is some effect, and a beneficial effect.

I think the most skeptical physician can be convinced if he will watch the results in his first three or four pneumonia patients treated with diathermy. One can confidently expect relief; I do not mean complete relief, but the patient will be made more comfortable at the end of even the first treatment. That may sound like exaggeration, but I have always tried to be conservative in my statements with reference to the value of physical therapy and diathermy in pneumonia. I am aware that any new form of therapy is apt to be scanned with suspicion by our leaders in medicine, and rightfully so. Certain of my colleagues who have

followed the progress of some of my cases have been so favorably impressed with this method as to have insisted upon this very treatment when they themselves were sick.

I have never found it necessary to use infra-red treatment for the relief of pain. Diathermy is usually sufficient. The discomfort, cyanosis and dyspnoea is relieved in the first twenty-four hours, or frequently there is a favorable change within six or eight hours. To say that the diathermy is responsible for some of these rather marked changes or sudden changes for the better is difficult, because our knowledge is still limited.

I think that stress should be laid upon the application of the electrodes. I have not been particularly interested in sharply centralizing my treatment over an area. If it is, as stated, the right lower lobe or the middle lobe, I include that in the range between my electrodes. I mean the electrodes should be larger than any involvement. I believe there is much benefit to be expected from the profuse perspiration that we evoke and what we strive for. Our patients are wrapped in blankets and are kept that way for an hour or two or more afterwards. Our aim is to obtain profuse perspiration and elimination. We are not particularly interested in limiting the area, and so we take in a good big area.

It is fairly agreed amongst us that diathermy is merely an adjuvant in pneumonia. For that reason other measures should be utilized whenever they are indicated. Proper elimination of bowels must not be overlooked, and cardiac stimulants must be administered at the right time when called for. One can overtreat with diathermy and cause depression of vital function. The pulse is therefore a guide of great value in treatment.

DR. W. B. OLSEN (Battle Creek, Mich.): I wish to emphasize again the importance not only of utilizing diathermy but also the use of oxygen. I believe that both ought to be used early.

It seems to me that in applying the electrodes, it is wise to cover not only the area but a little more, to be on the safe side. I think that is a good thing. It is better to make the mistake of having the electrodes too large than too small. Furthermore, I like the suggestion that we heard this morning from Dr. Tarbell, of including the heart in the treatment. I believe that is a wise course to take.

DR. ADOLPH A. LILIEN (New York City): My experience with diathermy in bronchiectasis was such that I gave it up because I obtained no results. I had to turn to something else. There are two ways of approaching bronchiectasis: One is by compression of lungs through pneumothorax, and the other way is thoracoplasty, as we do in forms of tuberculosis. Physical therapy can do only one thing when pneumothorax has been applied. We are now making experiments in that direction, and we are making experiments with the

Alpine light, with one idea in mind, to produce a general systemic effect.

Concerning the question of *Capacity* of machines, I agree with the gentleman, and I am glad it has been mentioned. If I were asked whether I would prefer to have a high class machine with which to treat a patient or one of these little playthings that are being advertised sometimes, I surely would say that I prefer a decent machine. But the average diathermy machine made by the average concern is a machine that can be used. I have worked with German and American instruments and I have found all are able to give about the necessary milliamperage that is needed for treatment. One thing must not be forgotten, and that is the resistance here is relatively small. It can be compared with the resistance, for instance, of longitudinal treatment, let us say, of a leg. At about 1400 to 1600 milliamperes of an average machine, if the plates are not too large, you will have enough heat.

I have made a few experiments on a dog with a bronchial fistula (which have not been published), inserting a little thermometer in the fistula and giving diathermy bilaterally, with the electrodes one near the thermometer and the other a little further away. I came to realize that the technic of application of the plates is very important. If I used electrodes that are too large, the condensation of heat is very small and the accomplishment is very poor. That is why I spoke about using a plate that is about the size of the area

that is involved. We cannot mathematically figure it out, but the physical signs and x-ray findings will determine how large the plate should be.

There was another issue touched upon, and that was the question of hyperemia. It is true that in the acute stage of pneumonia, at the beginning, we have an active hyperemia, but it is active only to a limited degree. It is localized just to the area involved. The surrounding area suffers from a passive congestion; the lymphatics stagnate. Diathermy changes the passive congestion or stasis to an active state. Absorption and toxic waste products are removed and the involved area is benefited by increased oxygenation.

About the problem of the abdomen in pneumonia, I am glad Dr. Fouts mentioned that. Care of the bowels is of great importance in any condition. In pneumonia it is of still more importance, because there is enough toxic material in the system without the added material in the intestines.

Another thing that speaks for that relationship is the fact that any nurse who observes a case will tell you, "Doctor, this morning the patient moved the bowels naturally." When you hear that you think, "Yes, there is some kind of a let-up in the condition." This is marking the turning point in the condition of the patient, because the reflex, through the toxicity of the system, has permitted a let-up on the gastro-intestinal tract.



SEMINAL VESICULITIS; ITS TREATMENT WITH DIATHERMY*

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Having thoroughly established a tenancy in the colliculus, the gonococcus endeavors to pass into the ejaculatory ducts leading to the seminal vesicles or seed sacks. These little pouches or seed bladders anatomically extend from the outer and upper border of the prostate behind the urinary bladder. They are usually one inch or at times two inches in length. The seed made in the testicle is here stored awaiting its use as a fertilizing agent by the male.

It was Fallopius who in 1561, while engaged in the study of pelvic anatomy, discovered for the first time the seminal vesicles. These little reservoirs were then practically lost sight of until the year 1745, when they received their first accusation as a cause of human suffering by the distinguished Morgagni. For centuries the evidence against the seminal vesicles has been gradually accumulating. This, however, has been such a slow process as really to belittle the importance of these organs as a factor in disease. In 1898, Collan published his epochal paper on seminal vesiculitis and analyzed the work up to that time. It was not until about 1900 that the vesicles began to receive due recognition.

FREQUENCY OF VESICLE INFECTION

How often does vesiculitis occur? This is a much disputed point among physicians. He who claims it is rare usually suffers from a short finger. I might even say that digits of this nature are common among physicians. A record of some of the observations of those of considerable experience will be of interest at this point. Among the older urologists wide difference of opinion also prevailed as to the incidence of disease. Allan, Collan, Fuller, Feleki, Guyon, Neisser and Wossidlo believed it a common compli-

cation of gonorrhea. Fournier, Horwitz and Scudder regarded it as rare.

Among later reports, Mayer in 1905, noted 60 per cent involvement of the vesicles in cases of posterior urethritis. Lewin and Bohm, in 1909 reported that in an examination of 1,000 cases of gonorrhea, 25 per cent showed a seminal vesiculitis. In the last twenty-nine years, we have examined a very large army composed of those infected with gonorrheal virus. These examinations were largely made under the best possible circumstances and ideal control. I arrived at the conclusion that a gonorrhea, strictly limited to the anterior urethra, was quite the exception. These patients even though placed in bed, and given the care of an acute febrile disease, developed evidence of a posterior involvement in the great majority of the cases. Enlarged and painful seminal vesicles were noted in about 75 per cent of this group. In a few instances, one vesicle was involved; the vast majority, however, showing a bilateral manifestation. Many of these vesicles were very large and did not subside under the treatment then in vogue. It has been our fortune to treat the patients of those who claim their gentle methods do not produce the complications noted by the writer. Unfortunately, the candle cannot always be hidden under the proverbial bushel, patients often going elsewhere when complications appear.

CAUSES OTHER THAN GONORRHEAL

Is seminal vesiculitis ever caused by any other agent than the gonococcus? Our records indicate a large group secondary to sexual irregularities, such as withdrawal just at the end of sexual intercourse. I want to emphasize that this practice not only causes the disease under consideration, but produces a terrific upset to the nervous system of both men and women. We

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are constantly seeing nervous breakdowns as the result of this pernicious practice. If you wish to prevent conception advise some contraceptive device. Its ill effects are bound to appear in time.

Bicycle and horseback riding also sexual excess are said to cause vesiculitis, but this is a theory without proof. Careless instrumentation by the surgeon is an undoubted factor to be reckoned with. What of prolonged and ungratified tumescence? This undoubtedly produces a tremendous congestion in the seminal vesicles, usually over a prolonged period, followed by inflammatory reaction. The logical advice is to avoid such a situation. The acute infectious diseases perhaps are accessories after the fact in seminal vesiculitis, but they are not common.

SEMINAL VESICULITIS IN INDUSTRY

In view of the development of workmen's compensation laws, infection of the seminal vesicles is assuming increasing importance. This has been brought rather forcibly to public attention by Dr. M. B. Wesson, particularly so in the common lame back and even in so-called hernia. Pain in the back and groins, Wesson believes, is a common complaint, and too often a diagnosis of sprained back and industrial hernia is recorded instead of seminal vesiculitis and its sequelae.

SYMPTOMS

The disease is generally considered as acute and chronic. We believe the former should be called subacute as that is usually the patient's condition when we see him. In subacute seminal vesiculitis we have an early infection. The symptoms are usually both local and general. The fever is commonly slight, perhaps 99 to 101° F., seldom higher, and is, as a rule, accompanied by headache, backache and general malaise.

As we stated under discussion of prostatic infections, it is very difficult to separate the two diseases as the general and local symptoms are so similar. Frequency of urination, bladder fullness with an apparent inability to evacuate, dysuria and pain are symptoms of almost any urinary condition. Frequent nocturnal emissions,

particularly if blood stained, are, however, more than suggestive of seminal vesiculitis. The late Dr. Ramon Guiteras frequently spoke of chordee of the bladder. By this he meant a feeling of stiffness in the neck of the bladder after urination. A sort of a sensation as if the bladder wall could not fully contract on account of the stiffened vesicles. If one glances at the anatomy of these little seed sacks, this indeed, will become clear.

Chronic seminal vesiculitis: In this type of the disease the symptoms as a rule are comparatively few. A generally tired feeling, irritation around the anus and pain in the back. Here we see many of the so-called rheumatic backs and lumbagos. At times one hears the statement that there is frothy urine in these cases, due to a seepage from the vesicles into the urethra.

The posterior pain is caused in the same manner as interference with the urine when it passes through the ureter causes the pain, or colic of stone. In vesicular inflammation there is a swelling which blocks the ducts so that nothing can get out of the sacks. At times there is a pain in the upper back and down the legs. This is said to be incident to the extensive sympathetic and parasympathetic nerves. Wesson believes that the nerve fibres ending in the prostate and seminal vesicle arise from the tenth dorsal to the third sacral nerves; so that it is possible for pain to be referred to any region supplied by them.

DIAGNOSIS

From the foregoing you will perhaps say the symptoms of seminal vesiculitis are vague. They are truly so, and much of the diagnosis depends on an intelligent rectal examination. A distinguished teacher once said that no man can successfully practice medicine who does not use his finger for rectal examinations. It is an astonishing fact that the average physician seems to think that massage of the prostate will clear up any deep urinary infection, the vesicles usually being overlooked entirely. Physical limitation, such as a short finger, is certainly a great handicap to both proper diagnosis and treatment in these cases. We have seen many patients who

have been treated by competent urologists without having the infection in their vesicles detected. In an acute seminal vesiculitis, these sacks will be found swollen and quite painful to the slightest touch. In an old case the vesicles are large and tender on pressure and at times seem to be a part of the prostate gland, or a direct extension of it. In these cases one passes his finger to the upper and outer border of the prostate and there he finds what appears as an extending wing or finger of the prostate. These projections are still fallaciously called by some of the old "school" the prostatic wings. There is another group in which, try as we may, the vesicles cannot be found in their normal habitude. What has happened? A perivesiculitis or a periprostatitis (that is an inflammation surrounding both organs) has occurred and the vesicles are bent down along the upper cornice of the prostate, even imbedded in the substance of the latter. Here we have a condition closely related to the pelvic cellulitis or peritonitis in the female. When we do not find the vesicle in its regular location, we explore the recesses of the prostate. Here only too often our patient will apprise us of a sensitive spot—the vesicle in hiding. You will ask how much pus is there present in our vesiculitis cases? This varies a great deal. Massage will often show pus in the fluid expressed but it is very difficult to tell where it came from. The fluid is not often typical of that from the seed sacks. One must bear in mind that there are many cases that might well be labeled "dry" vesiculitis—a condition difficult to prove but gaining in recognition. Pus does not often make its appearance, until the second to the fifth massage and at times purulent and normal fluid alternate. It is Wesson's opinion that this is due to the fact that frequently long standing infections are sealed in and it takes several treatments to break down the barriers releasing the pus and bacteria.

It is the opinion of Straub that the doctor who treats backache without clearing the vesicles, prostate or other source of infection is as guilty as a quack. Every case of backache in the male is worthy of a rectal examination. The gynecologists have demonstrated that a large amount of pelvic disease causes backache in the

female. Is it not justifiable to feel that the corresponding organs in the male may produce similar pain? Michel reports that 75 per cent of the cases of backache in men are secondary to prostatitis and seminal vesiculitis due to sexual irregularity or gonococcal infections. We find ourselves compelled to endorse that statement. Just think of the millions that are being paid in compensation insurance for gonococcal infections. No wonder labor organizations are opposed to physical examinations. Let us consider what we can do to relieve this annoying condition.

TREATMENT

It is a great mistake to overlook the complications associated with disease of the seminal vesicles. There is usually some urethral lesion, and this is only too often an old gonorrheal infiltration. These swellings are all potential strictures, and markedly interfere with drainage. Do not overlook that important word "drainage;" it is our most striking factor in the treatment of vesicle disease. Treatment begins by filling the bladder with an antiseptic, such as mercurochrome (half per cent) and then passing the largest sound possible. I must remind you that infection of the vesicles is only a stepping stone to that very painful malady, epididymitis. The utmost care must be exercised in urethral manipulations. After the urethra has been dilated to the proper calibre or along with the dilatation, diathermy is applied to the vesicles.

TECHNIC OF DIATHERMY

The technic used in diathermy is rather formidable in appearance and one should therefore obtain the patient's confidence before proceeding further. He must be told that the heat will come on gradually and that there will be no burns. Burns when they occur are very annoying and frighten the patient. A silent machine is greatly to be desired to relieve the mental strain of the patient. I might add that an instrument operating on an A. C. current comes very close to the ideal. Where a rotary converter is used it may become a real nuisance on account of the noise.

A block tin electrode about 5 by 7 inches, with the body surface well soaped is placed over the abdomen and the prostatovesicle electrode inserted into the rectum. The current is now turned on very gradually, that is, about 100 milliamperes every thirty seconds until we reach the point of tolerance. On our dial this is usually about 1500 m. a., while in degrees Fahrenheit, it reads about 114 to 116. A thermometer is seldom necessary for we can be guided by the tolerance of the patient. The time of treatment is about forty minutes. When our patient begins to feel cramps or is otherwise disturbed by the heat, it is at once reduced to the point of comfort. The patients often liken these pains to gas distress, and it is noteworthy that if the intestinal canal is full of gas, they will be felt much earlier. There is some difference of opinion as to temperature used and duration of treatment. We feel that we should give the patient not only as much as he will tolerate, but over as long a period as practicable. We have seen reports of ten and fifteen minute treatments, but

in our experience little good is accomplished by such sketchy methods.

We have treated a hundred and fifty-three cases by this method in our office, in the United States government service and in the local hospitals where we are connected. One of the very great advantages of treatment is the early relief of symptoms. Often this relief occurs after the third or fourth treatment. Many on being relieved, tend to stop at once and let the future take care of itself. They soon return, however. It is our custom to give these treatments twice a week and in a month there is usually a very marked improvement. In fact, more is accomplished in this space of time, than by other methods in three months. As to complete cures—they are about 60 per cent.

Dilatation of the urethra, followed by massage of the vesicle is a practical adjunct, and should not be neglected. By these procedures we improve drainage and promote the absorption of any exudate. This, as a rule, clears up most of our vesicle cases.

PHYSICAL THERAPY IN GASTRO-INTESTINAL DISEASE*

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For consistent, successful administration of any form of treatment it is essential not only to have a proper knowledge of the existing pathology, but a knowledge of the correct therapeutics for that pathological condition. For the successful use of physical therapy in gastro-intestinal disease, in order to obtain maximum therapeutic effect, the following requisites are necessary:

1. The correct diagnosis.
2. Knowledge of the normal physiological functions of the parts involved.
3. Knowledge of the principles and method of action of the modalities used.

4. A proper technic.

5. When necessary, use of concomitant measures, such as diet and medication.

Success is in proportion to the application of part or all of these essentials. A physical therapist with little or no understanding of gastroenterology, or a gastroenterologist with little or no understanding of physical therapy, cannot expect to treat successfully gastro-intestinal disease with physical therapy. The one attempting this, should be experienced in both, or there should be close cooperation between the physical therapist and the gastroenterologist in every case. When such is the case, success will follow. Otherwise, what is failure with one is success with another. And when successful results are obtained, especially

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in those chronic cases of long standing where other methods have failed, skepticism will give way to enthusiasm. Even cases ordinarily responsive to the usual dietetic and medicinal regime, do much better, and the results are more lasting when physical therapy is used in conjunction. The more than eight hundred cases of gastro-intestinal disease treated by physical therapy, of which this paper is a resume, include gastric and duodenal ulcers with and without colitis, duodentis, colitides of various origin and inflammatory conditions associated with adhesions, such as periduodenitis, perityphilitis, perigastritis and adhesions to the ovaries and tubes. Before therapy is started, the following procedure is carried out in every case. A careful history of the case is obtained; a thorough physical examination is made; a complete x-ray series is taken and necessary tests made. In this way, diagnosis, as correct as possible, are made. Good x-ray work is essential as this has been found to be very important in aiding in diagnosis and determining changes before and after treatment.

As soon as a diagnosis has been established there is considered choice of modalities best suited to correct the condition. The modalities employed are the infra-red lamp, ultraviolet radiation and diathermy. Briefly stated, as far as can be ascertained by experimentation and observation some of the effects of these modalities on gastro-intestinal disease are the following:

Infra-red Radiation.

The infra-red rays exert a sedative action on the terminal nerve ending in the skin zones corresponding to the parts involved. It is also possible that there is sent back reflexly, through the peripheral nerves to the abdominal organs, stimuli which are beneficial in character; through external hyperemia over the parts involved, there follows circulatory changes resulting in relief of symptoms.

Ultraviolet Radiation.

This acts first by improving metabolism in a general way. This is presumed to result from the activating effect of the rays on the

ergosterol in the superficial skin layers. This activated substance is taken up by the lymph and blood and circulated throughout the body. Appetite is stimulated; there is an increase in weight and a sense of well being. There is a sedative action on the nervous system. Insomnia is relieved. There is a stimulating effect on the endocrines resulting in their stabilization and coordination. Also, definite blood changes have been demonstrated. The bactericidal properties of the blood are increased; blood calcium, when deficient, is brought to normal and other changes have been demonstrated such as increase of blood platelets, hemoglobin and viscosity.

Diathermy acts in several ways, some of which are not entirely understood. Perhaps production of converse heat within the part is the effect best known. Heat produced in this way is hyperemic. Hyperemia dissipates stasis, aids in the absorption of calcifications and possibly in producing changes in abnormal fibrous tissue such as adhesions. Whether these changes can be satisfactorily explained by the action of heat alone is problematical. There must be considered, subject to further experimentation, such phenomena as cell response to wave action producing resonance or oscillations resulting in biological changes within the cell.

The effect of the heated electrode on the nerve endings in the integument is another factor that has not been emphasized sufficiently, and yet it may play a part in the production of beneficial results. Thus, in brief, are given a few of the effects produced by the different modalities employed. How can these be related in the conditions under treatment causing a disappearance of symptoms with ultimate improvement of the pathological state?

In gastric and duodenal ulcers, we deal with a lesion, the etiology of which varies in different cases. As many as thirty different causes have been given, among them are included infection, been given, among them being included infection, both local and focal, dietary indiscretion, endocrine disturbances, the action of toxins, neuroses and mechanical factors. It is probably needless to say that when possible the causative factors

must be sought and removed. In the treatment, the proper diet, one free from roughage and stimulating food, is essential. In physical therapy we have two useful modalities, which are well adapted to these cases: infra-red and ultra-violet radiation. Infra-red radiation acting on the nerve endings assists in preventing pain and indirectly causes a relaxation of gastric spasm resulting in cessation of symptoms produced by spasm, such as nausea, vomiting, regurgitation, bloating and belching.

Ultraviolet radiation exerts a manifold action. It increases resistance, and causes a subsidence of the infective process when this is responsible. Or when due to endocrine disturbance, it corrects this. Its favorable effects on the system, as a whole, helps in healing the ulceration. Results seem to bear this out. At first physical therapy was used in gastric and duodenal ulcers associated with colitis—in this way serving a double purpose. Recently it has been used as an adjuvant treatment in the ulcer alone. Most ulcers will respond to diet and medication, but experiences with physical therapy added to these show a longer interval of freedom from recurrence.

Duodentitis, as a rule, is acute in character running a course of its own, depending on the presence of the inciting factor. This also may follow indiscretion in diet. It is particularly common in constipation, and it may be toxic in origin. Chronic duodenitis is a condition more common than supposed, and it has a definite set of symptoms and signs. Frequently it simulates duodenal ulcer, and cases have been operated on as such. It is differentiated from ulcer by x-ray. Pathologically it consists of various states of inflammation from the simple to the hypertrophic. As a result there is spasticity resulting in either stasis or hypermotility. This condition is ideally treated by infra-red radiation and diathermy.

Periduodenitis, which as a rule involves the second portion of the duodenum, is produced as a result of adhesions. These adhesions may be of recent origin, very fine in character, especially when found immediately after gall bladder op-

erations. Or they may be very dense as a result of repeated gall bladder infections. Following gall bladder operations, adhesions form as a result of irritation from drains leading into the gall bladder bed. These adhesions may run from the old gall bladder site, from the peritoneal side of the incision or from both. The symptoms are those of duodenal irritation, almost resulting in some cases in obstruction, with intense pain radiating through to the back and only relieved by vomiting. The diagnosis is made by x-ray. When the case is seen early, relief and cure is effected by infra-red radiation and diathermy applied over the part involved. At times infra-red over the painful spot in the back is also useful. In old cases of adhesions from pericholecystitis, improvement depends on the density of the adhesions.

What has been said about adhesions to the duodenum applies to adhesions of other parts of the gastro-intestinal tract, such as perigastritis with adhesions to surrounding parts, adhesions between loops of intestines, adhesions at the cecum as a result of either appendicitis or perityphilitis, adhesions from the large intestines to the pelvic organs—the tubes, ovaries or to the womb, resulting from infection or following operations. When the adhesions are not too dense, considerable relief may be given for varying periods of time by the use of infra-red radiation and diathermy. The literature during the last few years contains many reports of the excellent results in these latter cases. Although there is no uniformity of method by all workers, diathermy and infra-red radiation seem to be the modalities of choice.

There is one condition in which physical therapy does not always give the good results obtained in other gastro-intestinal conditions. This is typhilitis, and where the inflammation is mainly in the cecum. There may be an accompanying inflammation of the ascending colon. Perityphilitis may present with adhesions to the appendix but with no primary involvement of the appendix. In cases that have come to operation, no pathological changes were found in the mucosa of the appendix, the pathology being confined to the serosa. The diagnosis of

typhilitis is aided by the x-ray. There seems to be no plausible explanation for the failure of physical therapy in these cases. This condition is mentioned because it is not a common diagnosis and may be treated as a colitis or operated upon for appendicitis. It is possible that a physical therapy method may still be evolved.

I must confess that my results with physical therapy in constipation, where the therapy has been mainly directed for the treatment of constipation, have been disappointing. This might be surprising, because of the fact that the literature abounds with a large number of papers reporting the cure of constipation by physical therapy. Ten years ago I used the sinusoidal current in many cases without result. In 1924, I tried again with a similar experience. Constipation has been helped indirectly when caused by other conditions, which have been cured by physical therapy. It seems to me that there is a great deal of misconception concerning constipation. The newer conception has not been grasped as it should be. Alvarez claims that he has never seen a case of atonic constipation. I would not go as far as that. I can say, however, that I have seen very few and most of these in redundancies, magacolons or secondary to adhesions and kinks in which an atony has been produced. Fully 80 per cent of constipation is not atonic. It is usually spastic, associated with a spastic colitis, either as a result of the colitis or producing the colitis. Other cases are those of wyschezia—so-called rectal constipation, resulting from bad habits or following rectal conditions. Constipation, especially when spastic in origin, when treated by sinusoidal current, will either be aggravated or unpleasant symptoms such as abdominal pains or burning will result.

Of all gastro-intestinal conditions, colitis by far offers the best field for physical therapy. I have employed it in this condition for over seven years with excellent results. Many of my first cases, unresponsive to all other measures, responded to physical therapy and some of these have remained well ever since. To date I have employed it in almost seven hundred cases and although the technic has been modified from time to time as a result of further studies and

use of improved apparatus, the treatment, in the main, is similar to that first used. Infra-red and ultraviolet radiation have been the modalities employed. As a result of experience, in treating colitis, there has been impressed on me the importance of a diagnosis based on the exact type of colitis present, and whether it is associated with or the result of another pathological condition. This is of importance as it may necessitate the simultaneous treatment of the associated condition. Of importance also, is the use of proper diet and, when necessary, the use of medication, primarily to aid in the relief of symptoms. One condition in which I have obtained 100 per cent results, and to which I wish to call particular attention is colitis associated with diverticulosis of the descending colon and sigmoid. From a careful examination of the x-ray films in these conditions, the symptoms seem to be due more to the colitis than to any diverticulitis that may be present. The typical picture of colitis can be demonstrated on the film before the treatment, and its disappearance following treatment. A summary of the results in the first six hundred cases of colitis treated with physical therapy is shown. The colitis cases have been divided according to their possible etiology.

Cause	Result
Adhesions, 123 cases ..	61 cases (or 49%) symptom-free
Traumatic, 100 cases ..	89 cases (or 89%) symptom-free
Infectious, 58 cases	28 cases (or 48%) symptom-free
Allergic, 7 cases	4 cases (or 57%) symptom-free
Ulcerative, 12 cases	2 cases (or 16%) symptom-free
Tuberculous, 4 cases ...	2 cases (or 50%) symptom-free
Endocrine	
Neurogenous, 293 cases ..	223 cases (or 76%) symptom-free
Diverticula, 3 cases	3 cases (or 100%) symptom-free

The following is the technic employed with the modalities used. The source of the infra-red radiation is a large generator with a two-foot reflector sufficiently large to cover a good sized area of the body. The reflector is placed as close to the body as can be tolerated by the patient, and centered over the part involved. Treatments of twenty minutes duration are given.

The ultraviolet lamps employed are mercury vapor in quartz, those with tungsten electrodes. The voltage is 75. The time of each treatment depends on the age and skin sensitiv-

ity of the patient. The time of exposure is increased each time as the tolerance increases, until treatments ten minutes in duration, front and back, are given.

For diathermy, two different types of machines are used, one with a frequency of 800,000, the other of 1,400,000. The best results are obtained with the machine of the lower frequency. The electrodes are lead, 22 gauge, 5 by 6 or larger, depending on the part treated. They are placed front and back covering the area involved. The milliamperage varies from eight hundred to two thousand depending on the tolerance and on whether the patient is stout or thin. Not over 1,000 milliamperes are given to obese patients. In three cases, milliamperage over this amount results in abscesses in the fat tissue, which were very painful and persisted for about three weeks. The duration of the treatment is from twenty to twenty-five minutes. Treatments are given three times a week, there being a minimum of thirty treatments. The infra-red radiation is given before the application of either ultraviolet radiation or diathermy.

CONCLUSION

It can be stated that physical therapy has proven its value in the treatment of gastro-intestinal disease. The cases to be treated must be well studied, and when physical therapy is deemed of use, a sufficient number of treatments should be given. The number of each depends on the individual case. Proper diet and medication should be combined with physical therapy. For the present physical therapy must be considered as an adjunct to the regular methods of treatment rather than vice versa. With increasing experience based on the handling of each the value of physical therapy will be more fully appreciated.

DISCUSSION

DR. GEORGE B. LAKE (Chicago): This paper of Dr. Levy's emphasizes several points upon which I have laid stress from time to time, although it does not offer any particularly new ideas upon the subject treated.

The essentials given by Dr. Levy for correct diagnosis in gastro-intestinal disease by physical means are no different from those which should apply in treating any form of disease either by physical or other ther-

apeutic measures. In all cases, if we are to be successful in our therapy, we must make a correct diagnosis, know the anatomy and physiology of the body, especially the parts involved, and the principles of the application of whatever remedy we intend to use. Whenever instrumentation is involved, a proper technic is essential. There are few, if any, methods of treatment today which are fit to stand alone. We must make use of every possible adjuvant to our main line of therapeutics in order to bring about the patient's prompt recovery.

All through this paper, one senses a feeling of uncertainty. There are too many repetitions of the words, "possible," "presume," "perhaps," "not entirely understood," and the like, and this is true not only of Dr. Levy's paper but of an unduly high percentage of the contributions on physical therapy which appear in the various journals. All this emphasizes my contention that the time has come for definite knowledge and proofs in physical therapy, based upon extensive and intensive clinical research, with the keeping of unimpeachable records. After we have done something of this sort we can speak with authority, which is not at present the case.

In connection with the diagnosis of gastric lesions, Dr. Levy has overlooked the possibilities of the Gastrophotor, that fascinating machine by which it is now possible, by a procedure no more difficult and time consuming than the passing of a stomach tube, to take 16 direct photographs of the interior of the stomach at one flash. By this method, many obscure stomach conditions can be brought to light and diagnosed with entire certainty.

In connection with the etiology of gastric and duodenal ulcers, Dr. George Crile, of Cleveland, gave an extremely interesting talk a few days ago, before the Inter-State Post-Graduate Medical Assembly, at Detroit, in which he presented a logical basis for the belief that gastric ulcers are due to electrolysis, resulting from the development of electrical energy produced by the difference in the reactions of the two sides of the pyloric opening. He expressed his belief that hyperthyroidism practically always precedes or accompanies gastro-duodenal ulcerations, and that these lesions may be permanently cured by a resection of a part of the thyroid gland and one adrenal. He showed cases to substantiate his contentions.

Duodenitis is probably more common than most physicians imagine, but, on the other hand, it is, in my opinion, fairly certain that a good many cases thus diagnosed are nothing more serious than pyloric spasm and can be relieved by the intelligent administration of hyoscyamin or atropin.

To mount one of my hobbies for a moment, I deplore the loose and ill-judged employment of the word "modalities" in a scientific paper. Dr. Levy has made rather free use of this expression. It occurs three times in one paragraph.

In summing up my impression, I have the feeling, on the basis of this paper, that the treatment of gastro-intestinal diseases by physical therapy, while it may be empirically successful in a considerable number of cases, is by no means so well organized and soundly based as we should like to see it.

DR. F. H. EWERHARDT (St. Louis, Mo.): I should like to have the speaker give us a little more technic on the subject of the treatment of spastic colon. Also, I would like to ask his opinion of high colonic irrigation. He said that physical therapy in general gave good results.

DR. LOUIS H. LEVY (New York Cty): First of all, I want to answer the question about the Gastro-Photor. I saw it when it was first demonstrated in this country by the Viennese doctor. It was introduced by Dr. Weiss of New York. Although there was some enthusiasm displayed, several objections were brought forth. The first objection was that the only condition the Gastro-Photor will show are possible erosions of the mucosa which cannot be seen by x-ray. Sometimes it may demonstrate if you can get the instrument pointed properly, a gastric carcinoma, and, secondly, it might show ulceration. It will not show an early carcinoma because what was personally shown to me was not of an early nature.

If one gets mucus in front of the small compartment, which is frequently the case, it will obstruct the view. In other words, one can not get a picture every time the Gastro-Photor is introduced. I have called attention to that time and time again. I firmly believe you can get more out of a correct physical examination and physical history. Another objection is that Gastro-Photor is an expensive instrument. It costs \$1.00 every time you snap the cartridge, and half of the time it does not show anything.

Regarding the association of hyperthyroidism with gastric ulcerations that is not a new contribution at all. Friedman in 1913 showed by experiments that he could produce ulcers by inoculation of thyroid tissue, and the literature is full of these cases. It therefore is at least sixteen years old. Crile may have emphasized the relation of the electrolytic dissociation as a precursor to gastric or duodenal ulceration, and might have shown the way to correct it.

Regarding duodenitis, it is very true that the ordinary cases of acute duodenitis can be cured by a proper regime. There are certain cases of chronic duodenitis, however, that can not be. Any man who has han-

dled these cases over a long time will appreciate the difficulty that these cases present.

Kirkland, in a recent issue of Radiology, demonstrated some beautiful pictures of chronic duodenitis—cases that were operated on for ulcer at the Mayo Clinic. He showed conclusively that you could differentiate a chronic duodenitis from an ulcer by changes in the x-ray picture. Whereas in chronic ulcer of the duodenum you get a regular and constant defect, with chronic duodenitis that picture tends to change. In Germany they have shown the condition to be due to hypertrophy resulting in a thickening of the mucosa, which simulates the so-called adhesion that one obtains from the gall-bladder. Those cases cannot be cured entirely by diet and medication because they are very stubborn. Those are the cases that are operated on for ulcers and get well. Those are the cases that will respond to physical therapy.

I have been specializing in gastro-intestinal work for almost twenty years. I can assure you I was troubled in my early years how to treat some of the cases that remained obstinate. My first interest in physical therapy was by mere chance. I used it cautiously because there was nothing to guide me. When I started to obtain results I became enthusiastic, even as you would, but I have never permitted my feelings to run away with my better judgment.

I have not cured every case. I have tried to show you that in colitis you must differentiate the case from the cause. I do say, however, I do not care what good results are obtained by the ordinary means in treating any of these gastro-intestinal conditions, if physical therapy is used as an adjunct the results will be better. I am not a physical therapist, I am a gastro-enterologist. But I want to assure you that I have treated 800 cases for 30 treatments or more. I have treated 2,000 or 3,000 cases where the patients have had only a few treatments. When you stop and consider that 800 cases times 30 treatments is 24,000 treatments, I feel I am experienced enough to tell you something about physical therapy in gastro-intestinal conditions. I have attempted to give you a conservative estimation of my experience.

It has been found definitely that if you take one pint and a half of fluid and pass it through a tube, you are going to get it around to the cecum. We can obtain just as much good by giving one enema and following that with another, as we can by forcing ten gallons of fluid in at one time. It is true that the patient feels good. The moment the entire colon is empty, the patient has a hunger feeling. The same thing follows after a good cathartic.

HIGH FREQUENCY CURRENT IN THE TREATMENT OF CHRONIC ENDOCERVICITIS*

(CONIZATION OF THE CERVIX)

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In presenting this paper, I do not intend to review the voluminous literature, past or present, or discuss the relative merits of the numerous methods of treatment advocated and practiced for the relief of endocervicitis, conceded to be the most prevalent of all gynecological disorders. It occurs in 85 per cent of women, is insidious in onset and course, is highly resistant to the ordinary therapeutic methods, and shows little or no tendency to spontaneous cure. It is my purpose to outline my further experience with an original method of treatment, conization of the cervix, devised in January, 1927, and reported in 1928, and the results obtained through its use in one hundred and eighty-nine patients, some of whom have been under close observation for two and a half years. Since all present are not gynecologists, a brief resume of the anatomy, histology, and pathology of the cervix necessarily precedes the presentation of the subject matter proper, in order that the rationale of the treatment may be better understood. Only by a thorough study of the normal cervix and structural changes in the diseased endocervix can the efficiency of any method of treatment be judged. Permit me to reserve for a subsequent paper a discussion of the arguments, *pro* and *con*, regarding the several methods of treatment recommended by various authorities and in use today. The pathology will be concise and inclusive, and illustrated with lantern slides, showing the structural changes produced by the disease under discussion.

The lower portion of the uterus or cervix is about one inch long and arbitrarily divided into three subdivisions: the supravaginal, intermediate, and vaginal; limited distally by the external os, and proximally by the internal os. The anterior fornix is shallow, the posterior deep.

The muscular layer contains a large amount of connective tissue and hence is firmer than the body of the uterus. At the isthmus the circular artery furnishes the blood supply. There are no sinuses in the cervix similar to those found in the uterus.

The distal portion of the cervix or external os is approximately five millimeters in its transverse diameter, sometimes circular, often oval, and covered by stratified squamous epithelium. Following pregnancy, instrumentation, infection, trauma, or disease, the os may be distorted or enlarged. The size can vary from a minimum, slightly larger than normal, to a maximum, when the circumference of the os coincides with the diameter of the cervix at its lower end. The internal os is circular, about one millimeter in diameter and rarely changes its definite shape.

The cervical canal, about one inch in length, lies between the internal and external os. It is fusiform or spindle shaped, its widest diameter nearly on a level with the posterior fornix and the narrowest portion at the internal os. So far as we know, it acts only as a passageway between the uterus and the vagina. The canal is lined by mucous membrane which is about one millimeter in thickness and presents a longitudinal ridge on its anterior and posterior surfaces from which a large number of folds or rugae, plicae palmatae, branch off obliquely and laterally, connecting these two ridges. Due to the numerous folds and plications this relatively small surface is increased in actual area, presenting an extensive surface to infection.

The epithelium at the isthmus is of the low columnar or cuboidal variety, some nuclei being near the upper portion of the cell, others either at the center or the base. Advancing toward the external os, this epithelium becomes of the high

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columnar, ciliated variety, about forty by four mu. in size, with a constant basement nucleus. At or about the junction of the middle and lower third of the cervical canal, a change takes place in the epithelium, the simple columnar gradually undergoing transition to the stratified variety. There is a definite basement membrane below the entire epithelium.

Scattered throughout the mucous membrane are many simple tubular glands about one to two millimeters long, similar to those found in the uterus, but the racemose variety predominates. The ducts open into the cervical canal. The glands usually stop at the basement membrane though some extend even beyond this structure, the depth from the surface being about three millimeters or one eighth inch. Approaching the internal os the glands become fewer and more shallow, and it is conceded that infection rarely, if ever, originates at this particular location.

There is a difference of opinion as to whether bacterial infection spreads by continuity or by the lymphatics. Regardless of the manner in which this takes place, it is a fact that primary infection of the cervix ascends into the uterus, Fallopian tubes, ovaries, and parametrial tissues.

The extent and rugosity of the cervical mucosa affords innumerable recesses for pathogenic organisms, while the traumatized and lacerated cervix is an open door to infection. The mucosa of the cervix becomes swollen, oedematous, and often everted with a loss of its cilia, while the mucosa of the portio about the external os presents a circumscribed area of glandular proliferation. The earliest stage of cervical infection is represented by an infiltrated area denuded of squamous epithelium, the result of necrosis and maceration of the surface layer, a true erosion but rarely seen at this stage.

The columnar epithelium under constant irritation of infection pushes itself out on to the vaginal aspect of the cervical rim, replacing the stratified epithelium, producing the so-called "erosion," classified as simple, if the surface is smooth and the glands few in number with no

dilatation; follicular, if the glands are numerous and dilated; and papillary, if the glands are numerous, running downward, parallel to one another, producing a papillary appearance, due to the numerous stroma papillae which project upward between the glands. The continued congestion produces a hypersecretion of mucous from the infected glands and ultimately a hypertrophy and hyperplasia of the cervical connective tissue. Sooner or later the crypts or the ducts of these glands become occluded, resulting in subsequent cyst formation commonly known as Nabothian cysts. This cystic condition increases the bulk of the already hypertrophied cervix, interfering with normal circulation and muscle contractility.

The symptoms are so well known that they are regarded as classic, and can readily be expected from the pathological changes described.

Reviewing what has gone before, the following facts are obvious:

1. The cervical canal is about one inch long and spindle shaped.
2. Infection is generally of the ascending type.
3. The brunt of infection is borne by the lower portion of the cervical canal.
4. The internal os and surrounding area are rarely, if ever, infected.
5. The glands are always infected.
6. The crypts and rugae of the cervical mucous membrane are excellent hiding places for pathogenic organisms.
7. Nabothian cysts result from occlusion of the gland ducts or from pressure.
8. The lining membrane of the cervical canal is one to two millimeters in thickness and has no submucosa, the glands reaching to the basement membrane.
9. Some of the glands extend beyond the basement membrane into the stroma of the cervix.
10. Simple tubular and racemose glands are found, but the latter predominate.

11. The anatomical arrangement of the mucous membrane increases materially the surface area of the canal.

12. The main cervical arterial supply is near the isthmus, thus far removed from the diseased mucous membrane.

Having briefly reviewed the anatomy and histology of the cervix and the pathology of endocervicitis, we come to a consideration of nature's healing process and the possibility of expediting it by treatment of the diseased area. With a clear understanding of how the reparative process progresses, the appropriate treatment suggests itself, thus assuring the patient a more rapid recovery, with a minimum impairment of cervical function, so important in subsequent parturition.

As an inflammation subsides, squamous epithelium proliferates from the sides, or regenerates from scattered islets still remaining beneath the columnar epithelium and displacing it. The squamous epithelium enters the neck of the glands and in some cases succeeds in entirely replacing the columnar variety normally lining these glands, filling them with a solid squamous plug and obliterating them. In other cases, only the gland openings are closed and retention or Nabothian cysts result. It is therefore evident that the natural healing process produces the replacement of the columnar epithelium of the cervix by stratified squamous epithelium, while the racemose glands are compressed by a mass of stratified squamous epithelium, which completely fills and obliterates them. These findings are the result of microscopic study of sections removed personally from healed cervixes, three and six months after conization.

The healed cervix differs from the normal in that squamous epithelium has replaced the columnar type, and the racemose glands have been filled and obliterated by the inroads of the same variety. Thus nature cures by mechanical obliteration, and any therapeutic procedure capable of producing the same effects is in accordance with the natural curative alterations.

It is conceded that when any of the various popular methods of treatment, short of complete

endocervical removal, fails to cure or relieve, a radical tracheloplasty becomes the method of choice, because it completely removes the diseased mucosa with its deeply infected glands. It is attained by a minimum amount of trauma to, and destruction of, the underlying muscular fibres.

If it can be admitted that the obvious method of treating diseased tissue is its removal in its entirety, assuming that such an excision is not inimical to life or future vital function, it logically follows that any such method of treatment becomes the ideal method to adopt in treating diseased tissue, whether in the cervix or elsewhere.

Conization is not based on theory or speculation. It is sound in principle and is based firmly on a foundation of demonstrated facts in the anatomy, histology, and pathology of the cervix. The natural process of healing is not interfered with; on the contrary, it is aided and furthered. While nature attempts to cure by sealing up or obliterating the diseased glands, they still remain in situ, whereas conization removes not only the diseased glands in the mucous membrane lining, but also the tissue in which they are imbedded, thereby promoting lymphatic drainage, so important for complete cure. The relining of the cervical canal proceeds rapidly and eventuates in a cervix with intact anatomical structure and a canal lined by squamous instead of the original columnar epithelium.

Conization has for its object the eradication and destruction of the diseased endocervical mucous membrane with its contained glandular structures, and this is accomplished with the preservation of the underlying muscle as well as the uninvolved tissues.

Local anesthesia only is necessary to insure a painless operation, making it an office procedure with no economic loss to the patient.

The instrument used in conization consists essentially of five parts as follows:

1. A metal tube ten or twelve inches long and one eighth inch in diameter;

2. A silicon tube one and a half inches long, attached to the distal end of the metal tube.

3. A fine tungsten wire, attached at the metal-silicon junction, its other end fitted into the distal extremity of the silicon tube. This tungsten cutting wire is not straight but describes an arc with its widest portion one eighth inch distant from the silicon tube. It thus conforms to the normal anatomical contour of the cervical canal which is fusiform or spindle shaped. To facilitate removal of tissue from angles, corners, or for biopsy, applicators with various shaped cutting wires have been made.

4. An insulating sheath of hard rubber encircles the metal tube to within one inch of its proximal extremity.

5. A metal sleeve covers the lower half of the insulated tube and makes electrical contact with the exposed portion of the metal tube.

A spring jawed clamp, attached by a conducting wire to a high frequency machine and fastened on the arm or wrist of the operator, provides the necessary contact between the applicator and the source of current. It also insures perfect freedom of motion and the necessary manipulations are not interfered with by the usual connection of the conducting wire to the instrument itself.

The applicator can be connected directly to the source of current, or indirectly by means of the spring jawed clamp.

The instrument is operated from a high frequency machine incorporating a special unit generating an electrical current of high wave frequency supplying unusual power to the cutting wire. This apparatus may be either of the gap or radio tube variety.

TECHNIC

1. The patient is placed in the lithotomy position, with legs well separated, and draped in the usual manner.

2. The operator seats himself comfortably before the patient.

3. The Hyams illuminated vaginal speculum is inserted to expose the cervix.

4. The vagina and cervix are freed of all discharge by swabbing with hydrogen peroxide and wiped dry. It is important that the cervical canal be freed of all discharge.

5. A small crystal of cocaine is placed in the cervical canal and allowed to dissolve, or an applicator saturated with 35 per cent solution is introduced into the cervical canal for five minutes.

6. The inactive, wet metal electrode about six by six inches in size, connected to the high frequency machine through a conducting wire, is placed on the abdomen and held firmly in place by means of a strap or sand bag; the patient is directed to make firm compression with both hands, so as to distract her attention.

7. Having wet the skin with water, a spring jawed applicator is placed on the arm or wrist of the operator and connected to the other pole of the high frequency machine through a second conducting wire.

8. The depth of the cervical canal is measured and the appropriate instrument selected.

9. The current is turned on until a stage is reached which will provide sufficient current for the operation.

10. The instrument is held firmly in the hand which has previously been wet with water, the fingers completely encircling the metal sleeve.

11. The other hand steadies the instrument and may be placed on either the insulated portion or on the metal sleeve.

12. The tip of the instrument is placed about one eighth inch from the external os and the foot switch closed, thereby turning on the current. A burning or searing of the tissue should take place.

13. With the current still on, the silicon portion of the instrument is immediately passed into the cervical canal up to the internal os, and with a rotary motion the mucous membrane is coned out.

14. The foot switch is released and the instrument withdrawn. The mucous membrane

with its contained cervical glands will be found adhering to the tungsten wire and the silicon tube, and a few drops of blood may appear in the cervical canal.

15. The instrument may be re-introduced and more tissue removed by repeating the previous steps if the operator so desires.

16. An applicator saturated with 2 per cent mercurochrome solution is now placed in the cervical canal and left in situ for several minutes.

17. A light packing of the vagina with gauze moistened with mercurochrome solution 1 per cent is all that is needed to control the slight amount of bleeding which might occur.

18. The patient is allowed to leave the table.

19. The entire operation should not take more than a few minutes.

About the fourth day a grayish slough will be found filling the cervical canal and is easily removed with a dressing forceps. The cervix and vagina are swabbed with 1 per cent mercurochrome solution. On the seventh day the cervical canal will be found smaller in size and granulation tissue can be seen. Between the second and third weeks the cervix approximates its normal size with only several small unhealed areas visible. About the fourth week the eroded areas are completely covered by squamous stratified epithelium and the entire cervix presents a healthy appearance. Vaginal douches are neither advised nor necessary.

The following resume is based on the re-examination of forty-eight patients of a total of one hundred and eleven, coned by me at the New York Post-Graduate Hospital Clinic. These patients were treated at various times from January, 1927, to January, 1929, and are among the first who came under our care. Many had not been seen since treatment was completed, previous to our recent check-up one month ago. The examinations were conducted in every instance by my associates at the clinic and their findings noted, a thing impossible with private patients. Seventy-eight patients in private prac-

tice and in other hospitals were purposely omitted from this series, only clinic patients being considered, for the foregoing reason.

AGE TABLE

Under 20 years.....	1
20-25 years.....	17
25-30 years.....	22
30-35 years.....	28
35-40 years.....	26
Over 40 years.....	17

A study of age incidence shows that in our cases endocervicitis occurred most frequently after the age of thirty years. That is a condition which frequently follows childbirth is evidenced by the following:

Sterile	17
Miscarriages, one or more.....	37
Para one	25
Para two	26
Para three or more.....	35
Instrumental delivery	14

SYMPTOMS

Discharge	70
Backache	48
Pain in lower abdomen.....	45
Dysuria	9
Metrorrhagia	6
Dysmenorrhea	5
Pruritus	5
Headache	4
Sterility	4
Menorrhagia	2
Dyspareunia	2

Discharge, backache, and pains in the lower abdomen were the most frequent symptoms complained of, either alone, or in varying combinations.

Total patients treated at P.G. Hospital.....	111
Patients examined September, 1929.....	48
Improved	46
Failed, requiring re-conization.....	2
Cervices showing visible scar tissue.....	0
Cervical contractures	0
Cervical stricture	0

Three women had become pregnant. One who came to us originally complaining of primary sterility and profuse discharge, has since been delivered at one of our large city hospitals, after a normal labor of twelve hours, with no undue laceration or trauma to the cervix.

Three others still showed uterosacral infiltration on examination, but had no discomfort or symptoms.

Eight showed small erosions of a type easily healed by local application. These patients were likewise free of symptoms.

Of the one hundred and eleven patients treated, thirty-five had returned four or five times at intervals of once a week following the operation.

ADVANTAGES

1. The method is used for the treatment of ambulatory patients.

2. The patient suffers no pain or discomfort.

3. The symptoms are relieved because the mucous membrane with its contained glands is removed, thus aiding nature in repair and at the same time expediting the healing process.

4. The danger of subsequent bleeding is practically nil.

5. No muscular tissue is removed, the cervix remaining functionally normal, and future parturition is not interfered with mechanically.

6. The technic, easily acquired, can be carried out by the clinician.

The cervix need not be drawn down to the vaginal introitus, thus avoiding the possibility of subsequent retrodisplacement of the uterus.

8. The cutting proceeds smoothly, the generated heat assuring asepsis.

9. Tissue can be removed to any desired depth.

10. Conization can be used for removing tissue for microscopic examination particularly in cases where dilatation and trauma are inadvisable.

11. The procedure may be repeated as often as is deemed advisable to accomplish its object.

12. Removal of the diseased tissue promotes and facilitates lymphatic drainage.

13. Conization results in a minimum of scar tissue because the division of the tissue is accomplished far more accurately than with the finest knife.

Conization is not recommended as a cure-all for any type of gynecological disorder. To insure success all pathology extraneous to the cervix must be carefully looked for and treated. Symptoms due to other causes than endocervicitis must be traced to their site of origin, e. g., a discharge resulting from uterine retrodisplacement must have its own specific treatment.

In conclusion, conization is offered as an additional link in the chain of progressive methods devised and in use to relieve the symptoms of chronic endocervicitis with the least discomfort to the patient.

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DISCUSSION

DR. A. D. WILLMOTH (Louisville, Ky.): I am very much interested in the method of coning out the cervix. It is much simpler and better than the old method of taking an actual cautery and literally cauterizing because there you could not control the depth of destruction of tissue and that was the reason it was abandoned by present-day gynecologists. I know of no place in medicine where physical energies serve a more valuable purpose than in gynecology. The class of cases the essayist has just presented are of that type that you can medicate as long as they are willing to come to your office, but very little good is accomplished. The simplicity of the method and the results obtained is a recommendation for its adoption.

Personally, for the removal of the mucous membrane I have resorted for years to the galvanic current, the positive pole, allowing the mucous membrane to adhere and removing it with the mucous membrane intact. I find this to be a superior method compared to the curet. I am inclined to believe that Hyams' method has even greater possibilities. It is more rapid and gives better results.

DR. GROUND (Superior, Wis.): I hardly know how to express my appreciation for the privilege of hearing this paper. It is a most timely one and on a subject that is very important. We know that cervical infections make up a large portion of our gynecological work, and my work is limited very largely to that class.

Years ago, I conceived the idea that the ordinary routine treatments of endocervicitis were futile, and I,

of course, have done the usual number of operations, trachelorrhaphies, Stromdorf's, and all that, but I early began to use the cautery. I was so cautery-struck that I would heat a scalpel and stick it up in the cervix. I am just reciting this to show the trend of my progress.

Soon after Dickinson published his article on the use of the nasal cautery in treating endocervicitis, I adopted that. It was a step far in advance. Most gynecologists and surgeons are enthusiasts on that. In our local meeting not long ago a gynecologist from Duluth and another from Rochester lauded the nasal cautery. Most of them had said, "if you can't cure the cervix cut it off and throw it away." We know the most skillful operative plastic on the cervix results in a damaged uterus. Of course the nasal cautery was quite a step in advance.

In the last two or three years I have used electrocoagulation. The heat from the needle inserted far up into the cervix is a sterilizing process, and I would strip the needle down along the cervical wall, meaning, of course, to leave tissues in between the line of cauterization.

This is much more efficient than the nasal cautery because the heat, as we know, is generated in the tissues, and heat is a great sterilizer. That is the method I have used, and my results have invariably been good. Once in a while I get some bleeding.

I can readily see that Dr. Hyams' technic is far in advance of that. I think we know more definitely what we are doing and I can see that the results will probably be better. I am only too glad to hear this paper.

Questions are frequently asked: Won't you have scar tissue with the use of the electrocoagulation needle up in the cervix? No, I have never had, and I have followed up case over a period of several years, and I am in a community not so big but that I can follow up most of my cases pretty well. Some of these men operating in the large cities can't keep track of their patients so well.

The scar tissue resulting from these high frequency currents is almost negligible.

I have used the cutting current in my work quite a good deal. I have gone so far as to take aggravated types of endocervicitis where electrocoagulation did not seem to be efficient for office work, and sent to the hospital. I have taken my cutting current and coned out the cervix, perhaps not so far or so deep, and prepared ligatures in anticipation of bleeding which did not occur. There was no after effects to worry over and no scar tissue formation.

I should like to ask the Doctor whether he sends his patients home and to bed or whether he keeps them up.

CHAIRMAN KOBAK: The technic of the method of applying an electrode to the forearm a one of the terminals for this type of cutting current is rather interest-

ing to me. I wonder if Dr. Hyams would not give us a little bit more of the detail on that technic.

I should like to ask him whether he uses with that technic the high frequency current, that is the so-called surgical diathermy, or whether he uses the cutting current from radio tubes.

DR. L. B. McDONALD (Chicago, Ill.): In the case of acute endocervicitis how soon would it be safe to cone out the endocervical membrane?

DR. SMITH (Seattle, Wash.): Infected material is harbored in the endocervix and becomes dispersed into other parts of the body more frequently than is generally recognized. From personal studies I have found it most difficult to cure this condition by any form of medication or by medical diathermy. In quite a large series of cases medical diathermy has failed to yield results equal to the cautery method. The objection to the cautery is the production of heavy scar tissue which interferes with childbirth. Conization appeals to me to be the logical method in these cases.

DR. E. B. MARKEY (Dayton, O.): Twenty-five years ago William Metcalf Polk, Professor of Gynecology of Bellevue Hospital of New York, told us to curet the entire cervix with a sharp curet and be sure to get the entire mucous membrane very deep. We supposed that that was the last word. When I started to treat these cases that was the thing I did, thinking that surely I had cured them. But I found that the patients would come back in a few months or a year with the complaint that I had not cured them. Since then I have used all of the recommended chemical and electric cauteries, but my failures have been just as consistent. I earnestly hope that in this method we have a technic that is beyond failure.

DR. MORTIMER N. HYAMS: I shall try to answer several of the questions. Let me start from the last as to the curet. About a year ago I read a paper over in Germany and after I completed the paper one man said that for twenty years he had been using a very fine nasal curet, and had been able to curet the cervix completely and cure every one of his cases. I immediately invited the gentleman over to the hospital any day he wanted, to select his own cases or I would obtain them for him. That was about a year ago and he has not shown up yet. To curet the cervix is a difficult problem. It is frequently impossible to accomplish. We have used diathermy and stopped. We do not use it any more.

How soon do you treat the acute case? We have not tried this method in any acute case. We try to get them at least in the chronic type, which would be about a month of treatment. After a month of treatment in the acute case, and we are very sure that our tubes are not involved, we attempt conization treatment of the cervix and not before.

As to the technic, the direct method is very simple. That consists of nothing more than a wire attached to the machine, as you see here, and by this method you can cone it out. In the indirect method, this is the metal sleeves, we referred to, which is attached to the inner tube or the inside tube here. (Demonstration) This is our coning out process. You can see the wire describes an arc with the widest portion at the midpoint, so that it is impossible to do any damage or take out too much tissue. The only way to take out too much tissue would be to repeat the process constantly until you got to the serous coat of the cervix. With a cuff on the arm and using the radio tube machine, the current is carried through your arm down to your fingers into the metal sleeve which carries through to the inner tube to the cutting end. That is cutting current only.

There is no sensation in your fingers unless we were to stop coning and leave our instrument in one place for, let me say, three to five minutes, or if we do not wet our hands or wet our arm there is a little sting to it, otherwise there is no sensation.

The direct and the indirect method accomplish the same, except that in the indirect method your hand is free to manipulate your instrument as you see fit, whereas, in the other method you have a wire attached to the end which pulls on our instrument. No pressure should be used at any time because the more you press with your instrument the less you cut. The ideal method is to remove as small an amount of tissue at each time as possible.

The technic I use is this: I cone out until I see a grayish membrane, until the folds and rugae of the cervix have been completely removed. I then believe that I am down to the basement membrane, and if I am down to my basement membrane I have removed all my inner cervical tissue. You might ask what becomes of the glands deep in the cervix. We hope that they fill by stratified squamous epithelium and we have proven that in a number of cases they do. If they do fill by stratified squamous epithelium, our patient is relieved or improved. I use the term improved instead of cured.

THE USE OF PHYSICAL THERAPY IN TRAUMATIC CASES*

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Ten years have passed since the World War ended. The many surgeons who had had experience in war work returned to civil life, bringing with them an abundance of new ideas to utilize in civil practice. One of the most important measures of treatment brought to us by way of that war was the use of physical therapy in the rehabilitation of the injured. It was not, in the true sense, a new mode of treatment, but rather a revival of therapeutic measures that had been in use as far back as the ancient Greeks, who developed the use of massage to a high degree of efficiency but let it fall in ill repute and disfavor when it was abused by the charlatans of that time. It has been frequently revived by somebody during the intervening centuries, and each time palmed off as something new; but it took the World War to demonstrate its true value in the treatment of injury cases.

I am not prepared to discuss the subject from the viewpoint of a physical therapist, but rather as an orthopedic surgeon who has observed its valuable effects in the treatment of traumatic cases. It has been demonstrated to my satisfaction that in physical therapy, as it is used today, we have a group of physical agents that have definite value in the treatment of our traumatic cases; it does not replace any part of the usual routine measures used in the management of these cases. We cannot forget the necessity of proper reduction and fixation in our fracture cases, and the neglect of wounds in their early stages will not be compensated for by physical therapy when used later in the case. We must not let enthusiasm for a good idea carry us away. We must consider it only as another good drug to help us in the treatment of the injured. Dr. Archie O'Rielly¹ and P. H. Kruescher² have independently emphasized this point in their papers on the same subject.

*Read at the eighth annual meeting, American Congress of Physical Therapy, Nov. 4, 1929.

The agents used in physical therapy are electricity, water, heat, exercise and massage. Electricity offers a method that has variable effects on tissue. The galvanic current stimulates muscle contraction and often aids in the regeneration of nerve and muscle power in a part where there is palsy following a nerve injury or disease. The most important form of electrical treatment in physical therapy is diathermy which, because of its tissue penetration, is more effective in joint care than any other form of heat application. It is the only form of heat that penetrates more than the depth of one-half inch into the tissues. Because of this penetration it is very efficient as a stimulant to circulation and in relieving congestion. Electric light cabinets and bakers stimulate circulation by heat, but it is only surface heat.

Water is used because it also stimulates circulation by reason of its variation in temperature and the massage effect it gives on striking the part in a spray formation or whirlpool bath. Exercise is effective in that it moves the parts, prevents adhesion, maintains function and prevents atrophy. Massage is used to rid the muscles of the fatigue waste products which develop after heat and exercise, and should always terminate the treatment no matter what method may have been applied in the past. It has been shown by Cajori, Cronte and Pember-ton³ in their article on massage, that this physical agent increases the urea output.

Traumatized parts of the body invoke a stasis of the circulation that causes edema and pain in the affected part. Because of this edema there is sluggish muscle action and this in turn prevents usage of the part. This disuse is followed by adhesions and atrophy. The habit of treating these cases by fixation in plaster paris casts that prevent observation, adds to this disuse and its resulting pathology. Dr. Hawley,

of Bridgeport, has called attention to the fact that the soft structures of the body, especially the muscles and tendons, move with the little friction that they do because of the lubrication which nature places between the opposed surfaces of the active parts. But if a part is put at rest and kept inactive, this excellent lubricant becomes a menace, in that it is changed to a gluish substance which quickly becomes organized and forms fibrous bands. Permanent adhesions are formed if the period of fixation is prolonged. It is the purpose of physical therapy to maintain, in an injured part, the normal physiologic function, as near as possible, and in that way prevent the disability from disuse. For that reason it is wise to use fixation that will permit observation of the part, and will also permit the application of physical means early in the case.

Therefore, if fixation that permits frequent observation and local treatment is substituted for rigid fixation that prevents observation, the amount of lost motion, lost power and atrophy of the part will be decreased. Further, if massage and passive motion are applied early together with the necessary physical agents, the sluggish circulation will be stimulated and a physiologic tone maintained in the injured part until it has healed sufficiently to reassume activity. In this way the period of disability will be lessened. With rigid fixation, after the trauma has healed, time is required to restore the power and motion that were lost because of disuse; while with physical therapy the motion and power are maintained, and when the trauma-disability has terminated, only a comparatively short time is required to reestablish normal action. Our results show a definite shortening of the disability period in cases treated with physical therapy. In a group of four hundred cases of fractures of the long bones, in males over fourteen years of age—all fractures being uncomplicated—we noted a shortening of the disability time of approximately 21 per cent. The table shows these figures:

	Days Disability	Days Disability	in Days	Percentage of Improvement in Disability Time
Clavicle	67	59	8	12%
Humerus	125	90	35	28%
Radius, ulna or both	76	64	12	16%
Femur	239	180	59	25%
Tibia, fibula or both	121	92	29	24%

Dr. Frank B. Granger⁴ has enumerated conditions that are especially amenable to physical therapy.

Nonunion and delayed union of bone respond to treatment by diathermy and ultra-violet rays. Low back injuries and contusions of other parts of the body also respond well to special physical measures. The cases of adherent scars and heavy scar-tissue can be aided by stretching, massage and vibration. Diathermy is especially effective in cases of bursitis. Neuritis and peripheral paralysis respond to galvanic and sinusoidal current, aided by heat and massage. Sprain should receive diathermy early. That physical agents can be abused has been the observation of Granger and others. Best results are obtained when they are used as an aid to the usual management of the condition under observation.

No one type of physical agent is sufficient in itself; the combination of the various agents, in conjunction with regular recognized treatment of the trauma is what produces results. To be effective, diathermy, by means of its heat penetration, must be associated with hydrotherapy and massage. To apply diathermy alone to a part, simply produces a bogginess of tissue, and it is necessary to follow this treatment up with another agent to relieve this bogginess. This applies also to other heat producing agents, such as the large therapeutic lamps and the electric bakers and cabinets.

Hydrotherapy is more effective by reason of its stimulation to the peripheral nerves than its temperature effect. This stimulation is the result of the mechanical impact against the skin

of the fine spray or whirlpool bath; added to this are the temperature changes from hot and cold as a factor in stimulating the nerve reflexes. It is an agent which must be used in connection with heat and massage to obtain good results.

Exercise is the real heart of physical therapy. It is directed at a definite muscle group by means of special machines which are made to produce motion of that part only. There is a machine to flex the elbow, another to flex and extend the wrist, another to rotate the wrist, an abductor of the shoulder, a circumductor of the shoulder and so on, for every movement of the skeleton. The amount of motion in the part under treatment should be measured by apparatuses made for the purpose. This provides a means for gauging the progress of the case. We have dial-like boards that measure the extension and flexion of the elbow, and every patient with elbow disability measures his range of motion before and after treatment. This helps us watch his progress, but what is far more important, it shows the patient that he is progressing and the psychological effect is to stimulate his cooperation and induce more favorable results. Holenblad⁵ states that exercise, above all other measures of physical therapy, should be carefully supervised. It is an easy thing for the patient to haphazardly go through a special movement ten or fifteen times and consider his job done and not direct the movements in a way that will aid in the restoration of function in the part. Granger calls attention to a very important phase of physical therapy management, that is, the treatment habit. He implies that the surgeon may neglect the art of determining the recovery of the patient by clinical observation and prolong the disability of these cases by being too mechanical. I feel that it is wise for us to keep a few of the old traditions of medicine by continuously cultivating the habit of using our clinical observation and not depending too much on the laboratory and machinery.

It is remarkable how properly applied exercise will limber up what appears to be a hopelessly stiffened joint; but it must always be used in combination with heat, hydrotherapy and

massage. The heat or hydrotherapy should precede the exercise, and the massage follow it to rid the tissues of the waste material of fatigue.

Massage should terminate all physical therapy treatment because it relieves the soft structures of the fatigue residue and tends to stimulate growth of atrophied tissues. In early care of cases it prevents atrophy. It should be done by a trained masseur, because there is more to massage than the mere rubbing of the part.

The main idea is to stimulate circulation in the part that has a lethargic circulation and to prevent disuse of the structure. Although physical therapy does this, it must be introduced merely as an aid to the regular care of traumatic cases, and should not interfere with proper rest, fixation and the healing of the injured part. But if physical therapy is not employed in rehabilitation of these cases, the surgeon is not doing justice to himself or the patient, since the slight increase in care and time expended in such treatment is amply compensated for. It yields so much satisfaction in the end-result that the surgeon and patient are more than repaid. Physical therapy is today a necessity in the proper management of traumatic cases.

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DISCUSSION

DR. JOHN ELLIS (Chicago): Dr. Rebhorn's paper is quite interesting to a group of us who are not strictly physical therapists, but who use physical therapy in connection with injuries. It may be that these men need more instruction, perhaps, than the physical therapists. His paper published in a magazine to reach the general surgeon may have a more stimulating effect than if it were published in a physical therapy journal which goes to a class that is already familiar with the treatment.

He mentioned a stated time for treatment. That is something that I presume all physical therapists are already acquainted with. A good many surgeons are now dabbling in physical therapy but most of them have not realized that if a man is given exercise to carry out himself at home, he doesn't carry it out in an intelligent manner because he doesn't have specific instruction. There should be a specific prescription the same as for medicine.

Showing the patient the result after the treatment is another valuable point that was made. After treatment, if a man has more motion in a stiff joint than he did before, it is very encouraging to the patient to know just how much more motion he has obtained by the treatment.

Dr. Rebhorn spoke of machine exercises, which have not, in my hands, been so successful as exercises conducted by first giving treatment.

In connection with passive exercise which the Massachusetts General has discontinued, I doubt if there is such a thing as passive exercise. If you move a part which has been injured and is stiffened, the patient resists the motion so that we really don't give passive exercise, after all; really, all passive exercise turns out to be motion.

DR. FRANK H. WATKINS (Shreveport, La.): In treatment of industrial wounds or traumatic conditions, I know of no better adjuvant than these physical agents. We find that rehabilitation, as the doctor said, is one of the necessities of an industrial surgeon. The fact that a man is injured and frequently can't go back to the position that he lost, puts the responsibility up to the surgeon so that he can make a living wage at some other work. In other words, a man may be so maimed as not to be able to return to the machine that he has been used to working, but we can fit him so that he will not be a derelict or a charge on society, and this we can more often accomplish by the use of physical methods.

I want to stress that after injury physical agencies should not be used too soon. We know that the repair of an injury of any kind is a normal physiological process of a pathological condition. If we take an injury such as a broken bone or a bad, severe strain, and give diathermy immediately after injury, we are taking the wrong course. We know that there is capillary oozing about the ends of the bones or the joint, and therefore, we will increase the hemorrhage, the pain and the swelling of that particular part. If you will refrain from using drastic measures such as diathermy, sine-currents and the like immediately, and place that part at rest, you will do more for it.

Rest is a physical agent, no matter how it is attained, whether it is accomplished by placing the patient in bed, in a splint, or in any other manner. Rest is essential almost after any injury from a few hours to a few days, at least. When nature thereafter begins

its work, we can help nature by adding physical measures to it. Merely to reduce a strained ankle or a Colles fracture and administer diathermy through it is wrong, because there is a certain physiological process that time only will repair.

The doctor spoke about diathermy as one of the potent remedies in these conditions. It certainly is a fact. Diathermy is a great pain relieving agent; it drains exudates; it quickens the arterial flow and lessens venous stasis. It creates a more positive chemotaxis at the sight of wounds and raises the opsonic index. Those things are essential in the repair of injuries.

Massage is one of the most neglected measures at the command of surgery. We usually turn it over to a technician, because the average surgeon is too lazy to do it himself. The only reason I do it is because I am interested in my patients. I like to massage them a little bit, because by so doing I point out to my nurses what I expect them to do, and as a means to check the progress of my case. Massage allows us to give that passive motion or rather that resistive exercise that Dr. Ellis spoke about; in fact, it is not necessarily passive motion, but a resistive exercise to put all the muscles in the injured group into play. We have found that resistive exercises are far better than the so-called passive motion.

One of the great features that I don't believe the doctor mentioned is the fact that it overcomes these so-called mental complexes tacked onto an injury. A complex tacked onto an injury is worse, many times, than the injury itself. We frequently laugh and joke about compensation-itis, but if you handle men whose highest thought is running a machine, whose general knowledge is not very great, whose ability to earn and to think, and think quickly, is not as acute as ours, you can appreciate the mental handicap they are under. They frequently develop delusions as to their state of health, complexes that are most fairly solved by compensation that eases the economic strain of the family budget. That plays a prominent part with a number of industrial workers, because they are probably not mentally alert as people in the arts and sciences of everyday life. If we can cure a complex, which can be overcome by the use of physical methods, we have done a great deal for the individual. Physical therapy applied to such cases makes the man think that something real is being done for him, that he is not being neglected and that even in his daily toil, if an extra hazard is placed before him, he will take that chance and do the job, knowing that he will be thoroughly taken care of at the hands of the plant surgeon who is employing physical methods.

I think the doctor's paper is very timely. It brings forth a message of the true results and capabilities of industrial methods.

DR. JOHN HUNTER (Toronto, Canada): There are just two things I should like to mention very

briefly. We are all familiar with arterial pressure, but venous pressure is really a more serious thing. The normal human body in a prone position has a venous blood pressure of about forty to sixty millimeters of water. One interferes with that pressure in every injury. A man receives an injury, and his venous pressure is immediately increased. The moment venous blood pressure is increased, a vicious circle is started up; stasis is produced in the capillaries, arterioles and arteries, back to the left heart, from the left heart to the lung and from the lung to the right heart. The left heart can no more take the blood from the right heart as it should do normally. Let us assume the right heart pumps its quantity into the lungs, whatever it is; the left heart takes that immediately and sends it on to the blood vessels. Here is where physical therapy can be used. Physical therapy, whether it be massage, hydrotherapy, electrotherapy, heliotherapy, or phototherapy, has physical effects. These physical effects reduce pain; they reduce muscular spasm. Dr. Ellis has told you that we do not have passive motion in injuries. If Dr. Ellis will relieve the pain and restore circulation, he has passive motion; there is nothing to resist it. That is the reason we benefit from passive motion. The moment we use a physical means to restore our venous pressure from being 150 or 200, you restore physiologic circulation in the lymphatic and venous system. The moment you do that you remove the stasis from the capillaries, from the arterioles and from the whole arterial system. There is the cure; there is where physiotherapy enters. It re-establishes the physiologic condition in the great arterial-peripheral blood system.

DR. OWEN MOORE (York, Neb.): I feel that in advocating rest after traumatic injuries, I would limit that rest to a few hours. What takes place in a traumatic injury where there is some effusion of blood, perhaps interfibrillar eruption of muscles? Who has not seen an injury the next day—so stiff that the patient could hardly move the part that is injured? I wish to stress one point. I would limit the rest period to a very few hours and then apply some mechanical current to the part. If it is a muscle, a mild sinusoidal current; if it is other tissues than the muscle, a static wave, or something to reduce the edema.

DR. H. CARLSON (Chicago, Ill.): We are all interested vitally in economics. From an economical standpoint, has the total cost of treatment been determined that has been entailed in addition to the regular treatment and a comparison between the time saved for the individual? Also, how were cases taken care of that were not hospitalized?

DR. E. H. REBHORN: The discussion has been healthy and therefore flattering. When a paper arouses discussion it has its merits, so I thank you. Dr. Ellis stated that machinery had not proven successful in exercising his patients. I might clarify my statement on machinery to the extent that all the machinery that we have in our institution is such that it is absolutely

under the control of the patient. He is not put in any machine and ground out like so much hamburger steak. Each machine is absolutely under the patient's control, and it is more or less active exercise with resistance. Probably we provoke some form of resistive-passive motion plus our active exercise in these cases.

Dr. Walke brought out the fact that the application of physical therapy to the traumatic cases should be applied with care early. I agree with him. I think it is a safe measure to lay down the rule that we should wait for acute reaction to subside before we begin to manipulate or apply physical measures of any kind to injured parts.

Dr. Hunter's statement on stasis is timely and explains a great many of the things about this that I did not venture to bring out.

The question as to the cost of the department applied to the amount of saving has been asked. In the long run we are certainly going to benefit. Our hospitals and industrial institutions are devoting themselves to the care of the injured of a big railroad corporation and its associated mines in the hard coal region of Scranton. We receive an enormous number of accidents. You won't believe me when I tell you that I dress one hundred out-patients, and every day I have added to my list anywhere from five to ten new accidents. I have under my observation at all times in my wards about forty fractures. That is the extent of my service. So you can see if we save 20 per cent of the disability in these cases, regardless of the cost of our physical therapy department, it is going to pay. I don't know exactly how much this department cost us. We put in all the apparatus we could think of at the time (that was in 1921), but I am sure it has paid for itself or will eventually pay for itself, because we are not going to stop working this week; we are going on for years, saving 20 per cent of the disability period and cutting down our compensation payments.

The hospital cases and the dispensary cases are the group that we handle. The cases that are not hospitalized are cared for through this dispensary in which, I say, I dress about one hundred patients each day. They are referred in to what we call our physical therapy department, the gymnasium. We send them to the gymnasium each time they visit us, with a prescription to the technician, telling her just what to do for each patient each time they go into the gymnasium.

DISCUSSION OF DR. REBHORN'S AND DR. OGDEN'S PAPERS

DR. J. S. COULTER (Chicago): I think there are two lessons we can derive from both these papers. They are both on the same subject, that is, physical therapy in industrial injuries. The first paper emphasized the need of exercise and Dr. Ogden in the end emphasized the need of education in physical therapy. I think this feature of education needs to be extended

not only to the doctors in charge of the physical therapy departments in industrial work and in hospitals, but also to the technician, because if you are going to make a success of physical therapy as applied to traumatic injuries, you must have the widest sort of combination of means to do this. For instance, in the after treatment of dislocations and fractures, you not only need heat and massage and muscle re-education and electrical muscle stimulation, but the prescription must be written by a doctor who knows muscle re-education, because without knowing muscle re-education you cannot properly apply electrical muscle stimulation. The prescription must be carried out by a technician who is competent and who has a thorough groundwork in anatomy. I think one of the most important things that we as doctors should do is to see that we are well grounded in physical therapy and to see that we employ, to carry out our orders, competent technicians. You cannot do what Dr. Rebhorn suggested unless you have competent technicians. Exercise and muscle re-education without competent technicians is a complete failure.

In both these papers the fact that exercise is very essential was brought out. One of the measures that some day I think will be used for vocational rehabilitation and exercise combined, is occupational therapy, a thing that has been very much neglected in talks about physical therapy. The best way to give exercise is with occupational therapy. Dr. Clopton at the Edward Hines Hospital has one of the largest educational therapy departments in town. It is very interesting to see the way men will exercise if they have some form of occupation.

We had one man out there who had an arthritis of his hand. They tried all sorts of methods and they never succeeded in getting that hand loosened up until they put him to weaving rugs in which he actually had to move that hand. He moved it only a fraction of a degree each day, but after weeks and months he practically got some use out of a perfectly useless hand. I think that is something that we too often neglect. It is a combination of occupational therapy for exercise. I think and hope that some day we will get to the vocational rehabilitation. Working from occupational therapy to vocational rehabilitation is an ideal that we still have and haven't quite succeeded in attaining in the practice of physical therapy in industrial surgery.

DR. C. H. OGDEN: In closing, I want to leave the picture which I briefly built up, that physical therapy has been sold to industry, that it is used in industry, that we have our technicians, that it has become constantly recognized as an integral part of the medical department; and it is only through combined supervision that we get results. By turning the case over to a technician and leaving it we do not get results. We need in industry, the same as in other departments, qualified, trained medical specialists to whom we may have occasion to refer cases, sometimes for diagnosis, sometimes for treatment.

With reference to vocational training, I feel that it is only when consolidated and concentrated that we will get results. In the larger cities it is practical that these centers shall be established, not for one industry but for a group of industries where these cases can be referred, and in this way we will get the maximum results.

THE STATUS OF ROENTGEN THERAPY*

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It is usually sufficient to report success within a reasonable number of cases with any particular form of therapy to insure a widespread clinical interest in, and investigation of, its merits. In the case of x-ray therapy, however, interest has indeed been lagging. In fact, there has been much unfavorable criticism. Desjardins, J.A.M.A., November, 1928, says:

"Whenever a patient who has been exposed to x-ray or radium for any pathological condition develops some complication, the cause of which is not obvious, the attending physician or surgeon is prone to attribute it forthwith to irradiation, although there can often be no possible connection. The path of least resistance is such a well beaten one and so easy to follow."

The difficulty lies in the fact that x-ray cannot be compared with a new drug or a new surgical technic. In the latter cases, dosage or method employed can be readily explained. A drug is given in so many grains or grams or in an easily measured concentration. A surgical principle or technic is explained in various anatomical terms understood the world over; in short, in a universal language. In case of x-ray therapy, however, dosage is discussed in many complex and individual terms. There is still talk of deep and superficial therapy; spark gap as a means of measuring voltage; focus or target skin distance. The very misleading term "Skin Unit Dose," established by Seitz and Wintz, is still in use. Since all conditions which influence dosage are never constant, the amount of x-ray necessary to produce a skin erythema varies at the different clinics from 30% to 300%, according to Heidenhain and Grebe and Martius. Seitz and Wintz as pioneers established a number of empirical conditions. With a given apparatus, the so-called symmetrie apperete, a 6 by 8 diaphragm at 23 cm. target distance, they obtained in a given time an effect on the skin which

produced a reddening in four to six days, a mild browning at the end of three weeks and a definite brown pigmentation in six weeks. In actual operation the Wintz clinic very often uses skin compression which is a most variable factor both in compressing the skin and in the pressure on the deeper structures. This variability may be due to sensitiveness of the patient, muscular tonicity, obesity, operative scars, etc. Yet the erythema is figured in all cases alike. Very few operators use any of the Wintz factors, and yet many try to obtain the same quality of erythema as their unit of dosage. It is quite obvious that by merely increasing the field of application to 8 by 10 c. m., that the condition in secondary and scattered radiation alone will be great enough to warrant an altogether different degree of exposure. The attempt to estimate the quality, quantity and biologic effect of the secondary rays is still not satisfactory. The works of Heidenhain and Fried and more recent investigators point to an ever increasing importance in the proportionate effect of these rays to the therapeutic result.

During my studies at the Wintz clinic, I was at a loss to account for the lack of consideration of biologic factors. The patients were treated too much from the point of view of the physicist, and measurements were based entirely upon results obtained in the water or paraffin box. The tubes were tested regularly on a box of paraffin 10 c. m. in thickness, because the lesions of a majority of patients (patients with malignancies) were estimated to be 10 c. m. below the surface of the body. I was therefore very much impressed when I came to the Elsher clinic in Debreczen, where the biologic theory of dosage of the Freiburg school was used. Here all measurements were made on the individual patient. With a small ratchet apparatus which exposed successively different portions of the

skin of the patient, the actual skin reaction for that particular patient was ascertained to be used in subsequent treatments. In addition, the circulatory peculiarities, general health, pigmentation, etc., were taken into account, so that where more than one exposure was made only the first could be said to be empirical and the others with a known accuracy.

Because of the importance of scattered and secondary rays, we must carefully distinguish between length (time of radiation) and strength (quality of rays) of radiation. We talk of deep and superficial therapy, of heavy dosage and mild. Very often when we speak of deep therapy, we mean a heavy dosage, and of superficial therapy merely a mild dosage. Superficial dosage may be given with hard or soft rays, and yet if we judge by erythema alone the amount of exposure will be unusually varied. The use of the roentgen unit as a means of measuring dosage has helped us little because so few workers have adopted it and because the condition under which the individual operator works are not the same.

As an example of the diversity of results caused by lack of uniformity in technique, the following may be cited. Phillips reported in 1925 (J.A.M.A.) a very large percentage of cures by the use of x-ray in cases of thrombo-angiitis obliterans. After direct correspondence with Phillips, an attempt was made to carry out his directions on three patients, but without success. The last patient, who was unable to walk more than half a city block without an attack of intermittent claudication, was sent for treatment, to the author of the report, in New York. After the third exposure the patient's condition was improved to the extent that he could walk without any symptoms of fatigue or pain.

It has been pointed out by Heidenhain that it would be justifiable for practical purposes to consider only the measurement of the primary rays in R units and to establish an individual erythema dose as a gauge for radiation; that, given a certain desired effect in the subcutaneous tissue we adhere to R units as a *time* gauge only, and keep all other conditions, filter and amper-

age constant. These R units should be ascertained on the patient's body and not by experiment on any phantom, and should be in terms of the primary rays measured at the skin surface. In line with this thought, Glasser's work towards the establishment of a definite unit and in the standardizing of measuring apparatus seems more promising because the tests are usually carried out on patients.

THE EFFECT OF X-RAYS

Another difficulty in trying to convince the profession of the value of this form of therapy has been the inability to satisfactorily answer the frequent question: "What will the x-ray do for this patient?" At first we depended upon the experiments of Fried with anthrax cultures. These cultures were irradiated and put into the incubator with control cultures. The irradiated cultures showed growths only after eight days, while the controls developed within 24 to 36 hours. And so we had the theory of a sort of divine wrath and destruction expended upon the mischievous and malicious bacteria.

Almost simultaneously came the theory of Porges, that benign science gathered from the destroyed leukocytes healing lysins with which to immunize the helpless sick against invading toxins of disease, but first there must be destroyed leukocytes—and the logical conclusion would be that the greater destruction, the greater amount of lysins and immunity produced. Most of the early experiments on tissue and blood changes have also emphasized the theory that x-ray is merely a destructive agent. Such theories may be the reason why so many workers have tried to solve the paradox of a terribly damaging agent which kills, and yet which admittedly sometimes heals.

From one hospital comes a very extensive work to show that a serious nephritis is produced by irradiation of the kidney and its surrounding tissues. From another clinic reports come of the serious damage to heart muscle by x-ray therapy applied to the chest. The biologists, too, have had their fling. Bagg and Little produced in mice generations upon generations

with serious anomalies of growth. Other "damaging" evidences too numerous to mention here have been reported. On this latter type of research attention should be called to the utter uselessness of x-ray experiments on small laboratory animals. It is definitely established that the smaller animals do not react in the same way as the human being to either the rays or certain drugs or stimuli. It is impossible to minimize the dosage so as to yield even any kind of comparison to the results obtained with moderate dosage and large field applications on the human being. Researches must be carried out with moderate dosage because we are now thoroughly convinced that anything above 50% of a skin erythema is harmful and useless. To minimize the exposure so as to apply to small laboratory animals would make it so small that the amount of rays would be practically nil. And because of the large field, 8 by 10 c. m. or more necessary to obtain results on the human being, the secondary and stray rays are entirely excluded in the lower animals. The fault with so many researches, of which the above mentioned are instances, is that they were all carried out with massive doses of 50% and over—procedures which are now admittedly obsolete. The best results to date are most certainly obtained with dosage ranging from 8% to 35% of the erythema dose. Within this limit it is possible to carry out all experiments on the patient, or at least on the larger laboratory animals.

In 1922 Buckey brought out very interesting light on the question of the effect of the x-rays in connection with his studies of the autonomic nervous system with very mild exposures—his so-called border line or grenz rays, and with mild x-ray doses. This was based upon the work of Embden and others who produced a decreased leukocytosis by injections of air and other substances intracutaneously. Buckey was able to imitate these results with x-rays and grenz rays, and proved that his success was due to the stimulation of the autonomic nerve fibres and their effect on the splanchnic nerves. His work was carried out mainly on the human being and on calves.

Krogh has shown that capillary circulation is almost always dependent upon stimulation of the autonomic nervous system. The capillary system in turn has been proven to be intimately bound up with the all-important reticulo-endothelial system, the study of which has recently been revived. The more active cells of the reticulo-endothelial system, according to Aschoff, are to be found in: The reticular cells of the spleen pulp, marrow, lymph nodes, the endothelium of the lymph sinuses, the blood sinuses of the spleen, the star shaped cells of the liver, cells of the adrenal cortex, cells of hypophysis, and the wandering histocytes of connective tissue. They have been shown by Kiyono to be hardly ever present in the general circulation, but are intimately related to the monocytes of the blood. The reticulo-endothelial system has been known to be intimately related, like the thyroid, to changes in the hydrostatic pressure and fluids in tissues.

It has been shown that the reticulo-endothelial cells have to do with the building up of immune bodies, not only through hemolysis, but also by developing immune bodies in the spleen. The reaction is not only against micro-organisms but also cellular toxins. These cells are capable of drawing certain substances from the blood and either regenerating or storing them. Thus they become blood cleansers. Ferments of the intestinal canal are said to stimulate them to increased activity. Through the introduction of lipoids and albumins, they develop a defense against streptococcus infections. Because of their stored acid coloring matter, they have anodal electrical potentiality. The significance of this latter statement may be of interest because of the theory advanced recently by Crile in the treatment of gastric ulcer. If we now add the findings of Dressel (quoted by Pohle) that irradiation affects the deep capillaries equally with the superficial, we should be able to summarize a theory as to the effect of x-rays on the system in the following way:

Moderate doses of x-ray directly affect the autonomic nerve fibres, which in turn change the pressure in the capillary circulation to allow for a difference in osmotic

permeability to various colloidal substances in the surrounding tissues. This chemical effect results in the greater stimulation of the reticulo-endothelial system, and this greater activity can (as has been shown by Zacherl, Bass and Joschka and others) promote increased phagocytosis and increased body resistance. The mere dilatation of a sufficient number of capillaries would have a very marked physiologic effect. Only a portion of the capillary (Krogh) system is in use at one particular time. Therefore the sudden dilatation and engorgement of an increased capillary area would divert so considerable an amount of blood from previous channels as to bring it in contact with new tissue spaces and new tissue fluids, and bring about a dilution of the existing toxins.

CLINICAL CONSIDERATIONS

In considering the clinical results of irradiation, we must bear in mind that we are dealing with one form of therapy only. Many conditions require two or three kinds of therapy. Sometimes it is necessary to supplement x-ray with surgery, sometimes with drugs, sometimes both. We do not claim that x-ray therapy is a substitute for surgery, but we do claim that the surgeon should use roentgenotherapy in selected cases as an aid or a substitute, and above all that frequently it will save his patient when all other methods are futile. This also applies to many conditions in internal medicine. Roentgenotherapy, because of its ability to release interstitial tension, often relieves pain when opiates fail. It is very common to have the patient say so immediately after the exposure. This is often true in diseases of the ear.

Mastoiditis, like sinusitis, is a condition not ideally suited for x-ray therapy, because we are dealing with bony cavity lined by epithelium, and so we do not always obtain complete results. The percentage of cures in this condition has, however, been very encouraging, and the exposures have (as will be seen later) always increased the resistance of the patient to operative manipulation.

In otitis media (especially where the nose and throat are simultaneously treated) the figures show almost complete success.

In osteomyelitis, Fried's method of merely

drilling through the bone to relieve tension and then use roentgenotherapy gave excellent results. In only a small number of cases was it necessary later to remove a sequestrum.

Professor Warthin of Ann Arbor in a recent paper has shown that in hyperthyroidism there is always an inflammatory element and that he can always demonstrate increased lymph node hyperplasia. This explains the remarkable success that x-ray therapy has had with this condition.

In the treatment of acute cervical adenitis with x-ray, many workers have reported high percentages of cures. In tubercular adenitis there have been similar successes. Of course, broken down glands must be removed or drained.

In suppurative conditions, the cases range through the whole gamut from the milder conditions of furuncles, carbuncles, abscessed teeth and infected sutures to the more serious phlegmons, abscesses of the lung, suppurative mastitis and even local and diffuse peritonitis. In many cases a puncture incision had to be made to relieve tension and permit some drainage. In all cases of infection, the time of treatment was markedly reduced in comparison with the time of treatment by the commonly accepted methods.

The details of some striking cases will perhaps be relevant: A case of septic emboli of the lung. The patient was convalescing from a post-operative pneumonia following an appendectomy. At the end of the third week he was suddenly seized with severe chills and fever ranging from 102 to 105, which lasted for four or five days. During the next two or three days his temperature dropped to a range from 100.6 to 102.6. Then, with a new shower of emboli, it rose again four or five days and again receded for two or three days. The patient continues this way until about the forty-second postoperative day. He looked very toxic. The blood culture checked up three times showed colon bacilli. He received three exposures. After the second exposure his blood culture was negative. Two days after the third exposure he was able to walk about the hospital corridor.

In a case of septic abortion (uterus was empty) the patient developed severe chills and fever. Temperature ranged from 102 to 103 in the morning to 105.6 and 106 in the evening. She developed severe pains in the right thigh and arm. On the sixth day she received an exposure at about 6 P. M. The next morning her temperature dropped to 99 and both extremities showed definite localization. These areas were opened with puncture incisions. Pus was found deep in the intermuscular sheath. A small piece of rubber drain was inserted. Her temperature that night was normal and she was able to leave the hospital five days after irradiation.

In a case of gangrenous appendicitis, the patient developed a diffuse peritonitis on the fifth postoperative day. A few days later a counter drain was made and the patient received three blood transfusions at intervals of two to three days. The patient was still very toxic. She was rayed on the 15th day and on the 19th day. She left the hospital improved on the 26th day.

In gynecology, roentgenotherapy has a wide range of possibilities. It was therefore quite natural that the clinics of Opitz and Seitz should be the pioneers in this field of therapeutics. Seitz showed about nine years ago the efficiency of temporarily stopping the menses for a period of six to ten months as an aid in the successful treatment of the inflammation of the adnexae.

Some pus tubes have been known to resolve within two to three days after treatment.

Where suppuration is well advanced, x-ray will, as in other pus conditions, cause localization and pointing, so that puncture incision readily completes the treatment. Because of the exposure, the recovery is always more rapid than where no x-ray has been used.

In the generalized sepsis of the puerperium and abortion, x-ray seldom fails. Occasionally it has to be supplemented with transfusion given about twelve hours previous to the exposure.

In cases of dysmenorrhea, there has frequently been relief of pain. In two cases I have

rayed the pituitary alone, and in three cases both the ovaries and pituitary. In the greater number, mild exposures over the ovaries alone have sufficed. Two cases have reported after six and eight months, respectively, a return of mild pain for one or two months only. The other cases have been free over a period of one to four years.

Seitz and the Viennese clinics have demonstrated a fair percentage of sterility cures with exposures over the pituitary. On this I have no personal statistics, because I have not been able to follow up these cases.

In the infectious diseases and so-called allergic conditions, roentgenotherapy is of value. I have had no success with the treatment of pertussis by roentgenotherapy alone, but in cooperation with the pediatrician who administered the vaccine or serum, no case, regardless of its severity, lasted over three and one-half weeks.

In case of hay fever, the x-ray has always relieved the patient but has not been able to completely stop the attacks.

In asthma, where the cause was an unresolved pneumonia or pleurisy or tracheo-bronchial glands, the results were successful. In other forms there was a mild improvement for five to six days only.

In six cases of erysipelas, two exposures, three days apart, were given in each case. In all the temperature subsided after the first exposure.

From a German hospital in Aussig, Bardachzi reports an interesting series of the more frequent complications of scarlet fever treated by x-ray with almost 100% results.

In cases of persistent bronchitis following colds in the debilitated, x-ray exposures will give dramatic results within three to twelve days.

In secondary anemias, minimal doses of 8% to 10% have shown much quicker results than ultra-violet rays. Most of the cases have responded to two or three exposures.

Lastly, in the question of malignancy, the recent report of Zacherl (also report of Morgan of Philadelphia) is in line with the contention that mild dosage, frequently administered, gives good results, whereas heavy dosage causes injury and often negative results.

The appended table of cases treated and results obtained shows the variety of conditions to which x-ray therapy has been applied.

SUMMARY

(1) X-ray therapy has not been readily accepted by the profession because of a lack of a universal unit of dosage.

(2) Many of the unfavorable results were due to massive dosage.

(3) X-ray therapy, by its effect on the autonomic nervous system and dilatation of the capillaries, results in greater activity of the reticulo-endothelial system, which has been shown to affect hydrostatic pressure within the tissues, promote phagocytosis and increase body resistance.

(4) Roentgenotherapy has been clinically demonstrated as an effective form of therapy.

(5) In many conditions, the period of treatment has been markedly shortened when x-ray has been added to other forms of therapy.

COMMENT

Rowntree a few years ago, at the meeting of the College of Surgeons, stated that at the Mayo Clinic the most frequent complication of laparotomies was postoperative pneumonia. In many clinics peritonitis comes second or third. Here the surgeon may find comfort in the fact that x-ray can help his patients in at least 84% (Heidenhain and Fried) of the cases. In those cases where x-ray therapy must be supplemented by surgical or other measures, there is at least the promise that the time of treatment can be shortened from 25% to 65%.

If roentgenotherapy will be given equal consideration with other medications and correctly used to supplement or to substitute for other less successful methods, we shall have made a rapid and progressive step towards the better care we all desire to give our patients.

Disease	Number of Cases	Number of Exposures			Failures
		Mini-	Maxi-		
Secondary anemia	10	1	3		0
Hodgkins	3	....	6		3
Acute mastoid	20	1	3		2
Chronic mastoid	12	3	14		4
Acute otitis media	42	1	4		3
Infected sutures	4	....	1		0
Furunculosis (upper lip and nose)	11	1	2		0
Axillary adenitis	14	1	3		0
Inguinal adenitis	13	....	2		0
Infected hand or foot	32	1	3		0
Infected hand or foot with lymphangitis and adenitis	21	2	3		0
Furunculosis	28	1	2		2
Carbuncle	10	....	3		1
Impetigo	6	....	2		0
Riggs disease	8	....	2		7
Abscessed teeth	8	1	3		1
Acne	20	1	11		4
Acute cervical adenitis	42	1	2		2
Asthma	8	1	6		2
Hay fever	6	1	4		6
Acute arthritis	13	1	3		5
Chronic arthritis	4	....	3		1
Bronchitis	18	1	3		2
Septic emboli of lung	1	....	3		0
Diffuse peritonitis	3	2	3		0
Localized peritonitis	2	....	2		0
Postoperative pneumonia	4	....	2		0
Eczema	24	1	3		3
Herpes	6	1	3		5
Corns and bunions	10	6	14		2
Mastitis	4	....	3		0
Pleurisy	3	1	6		0
Infected ringworm	17	1	4		2
Enlarged thymus	8	....	3		J....
Hyperthyroidism	10	3	11		0
Tuberculosis of sternum	2	....	5		0
Tuberculosis glands of neck	8	3	4		0
Adenoma of finger	1	....	6		0
Duodenal ulcer	3	2	4		0
Phlegmons	3	1	2		0
Uterine bleeding	10	2	4		0
Parametritis	4	—	2		0
Pelvic infection	6	....	2		0
Temporary cessation of menses	16	1	2		0
Climacteric symptoms with permanent cessation of menses	19	1	3		0
Septic abortion	6	....	2		0
Puerperal Sepsis	4	1	3		1
Endocervicitis	6	....	2		?
Dysmenorrhea	13	1	2		0
Pituitary for sterility	12	1	2		?
Salpingitis	17	1	3		0
Fibroids at climacteric	4	1	3		0
Erysipelas	6	....	2		0
Pertussis	12	1	3		0

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

**1930 Annual Meeting in St. Louis
September 8, 9, 10, 11, 12, 1930**

A MESSAGE TO THOSE IN THE RANKS

The American Congress of Physical Therapy is now in its ninth year of existence. Its chief purpose is the promotion of scientific physical therapeutics. Its membership is comprised of duly licensed physicians who are in good standing in their county and state societies and in the American Medical Association. During the past few years numerous changes have taken place in the organization and definite progress has been made to insure the advancement of the science. The annual scientific sessions have attracted prominent teachers of medicine and clinicians, and the programs have always been prepared with the view of obtaining the best material available. The attendance at these yearly sessions bespeaks the popularity of this physical therapy association among good standing physicians. The future holds forth even greater things than have been accomplished in the past. In order to carry on, executive and editorial offices are maintained in Chicago and a full time executive secretary conducts the many duties incumbent upon these offices. The membership in the Congress is not as large as that of other medical organizations. The reasons are obvious. No open solicitation has ever been made for new members. Members are acquired either by voluntary application or through the solicitation of physicians who believe they have gotten some good out of belonging to the Congress.

The funds to carry on have been derived from annual dues and from some little profit which has accrued from the annual sessions. The sessions of the past two years have yielded little

if any extra revenue, so that the annual dues have been the main source from which the yearly budget could be made.

An analysis of records in the college office shows that there are quite a few members who are in arrears. If these delinquent funds were available to meet current obligations, a bigger and better program could be carried out. A plea is made at this time to all who have not as yet sent in their 1930 dues to do so at once. A plea is likewise made to those who are delinquent in their dues for more than one year to remit promptly. Members who are in arrears for more than three years will be dropped from the roll and their subscription to the *Archives*, the official monthly publication of the Congress, will then cease. This publication is the outstanding American journal devoted exclusively to physical therapeutics. Its transactions are eagerly sought by all physicians interested in this branch of medicine.

To those who are now in good standing a plea is made to obtain new members. At the last annual session held in Chicago each fellow pledged himself to secure one new member for 1930. Several new applications have been received, but these represent only a small percentage of what was promised. Now is the time to act. The drive is on. Applications may be had by writing to the executive offices at Chicago. The goal is a total of one thousand members for 1930.

This year's meeting will be held in St. Louis, September 8, 9, 10, 11 and 12. Great

plans are under way. An intensive week of post-graduate work in physical therapeutics is promised. No expense will be spared to gather the country's leading authorities to teach, to discuss, and to demonstrate physical therapeutics from the very fundamentals of the basic sciences to the advanced knowledge of the subject. The clinical side will be stressed. The specialties of medicine and surgery will be duly represented. The aim is to emphasize only what is rational in physical therapy. This meeting in itself should serve as an attraction to not only those who have contemplated joining the ranks of the Congress, but also to others who have procrastinated because of no good or valid reasons.

RADIATION THERAPY OF TONSILS

Considerable controversy has always resulted from the suggestion of any physical method as a substitute for surgical tonsillectomy, and particularly so with reference to radiation therapy of tonsils. The recent article by Knox¹ seems to rationalize, for the time being, at least, the status of roentgen irradiation of these lymphoid structures. It very reasonably emphasizes that radiation therapy of the tonsils should not replace tonsillectomy. Definite indications and limitations are detailed.

Knox states at the outset that because of the little understood effects of the x-rays, impossible results, both harmful and beneficial, were attributed to them. In this report an attempt is made to study the tonsil problem on the basis of pathology. Numerous authorities are cited to uphold certain contentions. The tonsils of 259 patients have been treated during the last six years, 141 of whom were followed from three months to six years. In general, four, six or eight treatments were given at intervals of about a week, through a small portal, 4 by 6 cm. Sixteen per cent of the patients had had from one to three tonsillectomies.

The results of this study appear to define the scope of radiation therapy scientifically employed. It should not replace tonsillectomy in the rheumatic child, whether with or without endocarditis. It may, however, be substituted with benefit in those patients who, because of some complications or because of the severity of their

cardiac condition, are not proper subjects for operation.

"X-rays should not be used in acute follicular tonsillitis, sepsis, generally not in acute leukemia even with tonsillar masses, mononucleosis, Vincent's angina, syphilis, diphtheria, scarlet fever or abscess of any type. It is contra-indicated in acute sinusitis and probably is not of much value in the chronic types."

Every laryngologist is confronted with the problem of dealing with pharyngeal hypertrophies and with recurrent tonsils and adenoids. For these indications, Knox recommends radiation as a useful and important therapeutic agent.

"Elderly patients with chronic or recurrent sore throats are usually rendered more comfortable and the frequency and severity of their colds are diminished for a period of several years at least."

In the conclusion of Knox's article the following appropriate comment is made:

"The indications for tonsillectomy and for roentgen irradiation are in any case more clinical than morphologic or theoretical, but in general the pathologic conditions most amenable to irradiation are chronic hyperplasia, whether simple or on a known infectious basis, chronic interstitial tonsillitis only rarely, and chronic atrophic tonsillitis associated with chronic hypertrophic glossitis or pharyngitis."

A discussion of this subject is indeed timely. The excellent recital of these investigations which appear to have been scientifically conducted is a helpful means of evaluating a form of therapeutisc regarding which there have been more than the usual uncertainties.

¹Knox, Leila Charlton. Radiation Therapy of Tonsils, J. A. M. A., Vol. 94, No. 10, p. 705. March 8, 1930.

IMPORTANT ANNOUNCEMENT

A POST-GRADUATE WEEK OF PHYSICAL THERAPY

Ninth Annual Meeting

AMERICAN CONGRESS OF PHYSICAL THERAPY

September 8, 9, 10, 11, 12, 1930

New Hotel Jefferson

ST. LOUIS, MISSOURI

Plans have already been completed for the 1930 session of the American Congress of Phys-

ical Therapy. The entire week of September 8 will be devoted to post-graduate instruction in physical therapy. This program of teaching will include both theory and practice and will range from the basic fundamentals to the more advanced subject. Every phase of physical therapy will be included: light, heat, electricity, radium, x-ray, therapeutic exercise, massage and occupational therapy. There will be clinics and clinical addresses, and a special half day session in the sections of medicine, surgery, and ear, nose and throat will be devoted to the consideration of inter-related and borderline problems. The week's work will be of the most intensive nature and of real post-graduate calibre. A preliminary schedule will be published about June first. Those interested are advised to send for this schedule and make early reservation as from all indications there will be a capacity attendance. This might necessitate limitation of numbers for special classes.

A unique part of the program will be a half-day session set aside for the consideration of problems of the physical therapy technician. Technicians will be permitted to enter into the discussion and to present their problems by address, subject to the rules of the Congress. The purpose of such a joint session as this is to create a closer and more mutual understanding between physician and technician and for the interests of improved results in the work.

While practically all participation in the program will be on an invitational basis, an opportunity is afforded those of the members who desire to take part to write to the chairman of the program committee and state what they have to offer for the interests of the session. Suggestions are welcomed and if they possess merit will be put into effect.

Unfortunately only a limited amount of space will be available for technical exhibits. Manufacturers and dealers desirous of displaying equipment are urged to apply to the executive secretary immediately as the space will be assigned in the order in which applications are received. Diagrams are now available.

The new Hotel Jefferson has been selected headquarters for the Congress. Reservations

for rooms should be made direct with the hotel management.

The local (St. Louis) chairman of arrangements is Dr. F. H. Ewerhardt. All matters pertaining to the program and exhibits should be taken up with the executive secretary, Miss Lucille White, Suite 716, 30 North Michigan Avenue, Chicago.

POST GRADUATE COURSE RADIOLOGY

In Vienna, June 23-28, 1930, a post-graduate course of the German Society of Radiology will take place. Topic: "Progress of the Diagnosis and Therapy in Radiology." Twenty diagnostic reports, 5 therapeutic ones. Place: Institute Holzknecht. Fee: For complete course, 25 Austrian shillings. Number of participants: maximum 60. Apply to Kursburo der Wiener Medizinischen Fakultat, Vienna, VIII Schloßgasse 22.

A WEEK OF PHYSICAL THERAPY IN LOS ANGELES

June 9-14, Inclusive

The twelfth annual session of the Western School of Physical Therapy will be held in Los Angeles, Calif., June 9-12 in conjunction with the annual meeting of the Pacific Physiotherapy Association, which will hold its sessions on June 13 and 14 at the Alexandria hotel.

The faculty of the school will be practically the same as last year including Drs. B. B. Grover, A. D. Willmoth, J. E. G. Waddington, and with the addition of Drs. J. C. Elsom and M. W. Kapp.

The entire mezzanine of Hotel Alexandria will be occupied by the exhibits, which, this year, will be more complete and more elaborate than last year.

With the exception of last year's meeting, all of the sessions of this school have been held in Kansas City, Mo.

The classes will be limited to regular physicians, fourth year students, and technicians properly sponsored.

For further information and program, address Dr. Charles Wood Fassett, Secretary, 506 Detwiler Building, Los Angeles, Calif.

THIRD INTERNATIONAL CONGRESS OF ROENTGENOLOGY, PARIS, JULY, 1931

The third International Congress of Radiology will be held in Paris at the end of July, 1931, under the high patronage of the president of the French Republic and the honour-presidency of Mrs. P. Curie.

The work of the congress will be divided under the following sections:

1. Roentgendiagnosis.
2. Roentgen and Curie-therapy.
3. Radiobiology.
4. Radio-Physics.
5. Natural and Artificial Heliotherapy.
6. Medical Electrolgy.

In conformity with the regulations of the international roentgen congresses, membership of the congress will be open to: (1) Members of the national medical roentgen societies regularly constituted; (2) persons accepted by these societies.

The bureau of the third International Roentgen Congress is thus constituted:

President, Dr. Antoine Beclere.

Vice Presidents, Dr. Belot and Pr. Regaud (Paris), Pr. Cluzet and Pr. Rechou (Province).

Secretary General, Dr. Ledoux-Lebard.

Treasurer, Dr. Hendi de Rothschild.

Adj. Treasurer, Dr. Morel-Kahn.

Secretaries, Dr. Claude Beclere and Dr. P. Gibert.

THE STUDENT'S LIBRARY

BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selection to be made for review.

CLINICAL ELECTROCARDIOGRAMS: Their Interpretation and Significance. By *Frederick A. Willius*, M. D., Section of Cardiology, The Mayo Clinic, Rochester, Minn., and Associate Professor of Medicine, The Mayo Foundation, University of Minnesota. 219 pp. with 368 illustrations. Cloth, \$8.00. Philadelphia: W. B. Saunders Company.

CLINICAL OBSTETRICS. By *Paul T. Harper*, Ph.B., M.D., Sc.D., F.A.C.S., Fellow of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons and of the New York Obstetrical Society; Clinical Prof. of Obstetrics, Albany Med. College; Regional Consultant in Obstetrics New York State Dept. of Health. Pp. 629, illustrated \$8.00. Philadelphia: F. A. Davis Company, 1930.

ROENTGENOTHERAPY TECHNIQUE. By *Darmon Artelle Rhinehart*, A.M., M.D., Professor of Roentgenology and Applied Anatomy, School of Medicine, University of Arkansas; Roentgenologist to St. Vincent's Infirmary, Baptist State Hospital, Missouri Pacific Hospital and the Arkansas Children's Hospital. 388 pp., 159 illustrations. Lea & Febiger, Publishers.

RADIUM IN GENERAL PRACTICE. By *A. James Larkin*, B.Sc., M.D., D.N.B. 304 pp., 28 illustrations. Paul B. Hoeber, Inc., Publisher.

"ANLEITUNG ZUR DIATHERMIEBEHANDLUNG." von *Dr. G. Bucky*. Third edition. Paper, price 10.50 marks. Pp. 224, with 138 illustrations. Berlin: Urban & Schwarzenberg. 1929.

SUPPLEMENTUM III, PART II, ACTA RADIOLOGICA, Abstracts of Communications of the Second International Congress of Radiology, Stockholm. 260 pp. Stockholm: P. A. Norstedt & Soner, Publishers.

SUPPLEMENTUM V, ACTA RADIOLOGICA, Catalogue Des Portraits, Deuxieme Congress International de Radiologie, Stockholm. 268 pp. Stockholm: A. B. Hasse W. Tullbergs Boktryckeri.

TREATMENT IN GENERAL PRACTICE. By *Harry Beckman*, M.D., Professor of Pharmacology, Marquette University Medical School, Milwaukee, Wis. Octavo volume of 899 pages. Philadelphia and London: W. B. Saunders Company. 1930. Cloth, \$10.00 net.

INTERNATIONAL ABSTRACTS

Radium in Treatment of Diseases with Subcutaneous or Mucous Membrane Hemorrhages. J. M. Hofman. Radiology, 14:136.

Hoffman is convinced that radium offers a new and valuable aid in the treatment of hemorrhagic diseases of the new-born, as well as in simple purpura hemorrhagica. In hemophilia, radium will offer help in controlling the severe hemorrhages without the aid of other medication, and may be the means of aiding the organism to eradicate the disease completely. He warns that if the total erythrocyte count is below 1,000,000, this method must be used cautiously because of the hemolytic action of gamma rays. Preliminary transfusions should be used to bring the blood volume above that level.

Radiology as Complete or Partial Substitute for Surgery in Treatment of Cancer of Female Pelvic Organs. J. Heyman. Surg. Gynec. Obst., 50:173.

In cases of cancer of the cervix, Heyman says that radiologic treatment is the method of choice. Operation should be resorted to only if radiologic treatment has failed. In operable cases of carcinoma of the body operation should be done, followed by irradiation. Regarding the relatively large group of borderline cases in which surgical intervention, on account of general conditions and technical difficulties, is less advisable, one must, in making the choice between surgical and radiologic treatment, carefully consider the size and shape of the uterine cavity. Surgical treatment is to be preferred in patients with a large and irregular uterine cavity, whereas radiologic treatment is more likely to be successful if the cavity is narrow and of regular shape. In cases of cancer of the vagina, surgery ought to be entirely replaced by radiology. In cancer of the ovaries an intimate cooperation between surgical and radiologic treatment is required. Surgical treatment, aiming at the removal of the ovarian tumors, must be tried first. In patients who have had the radical operation as well as in those who have not had the radical operation, operation must be followed by irradiation. In a number of these cases radiologic treatment will bring about a considerable improvement and in some it may pave the way for a subsequent successful operation.

Röntgen Diagnosis and Therapy of Thyroid Disease. J. Remer and W. W. Belden. Radiology, 14:145.

Remer and Belden urge that certain patients with toxic goiter should be given the benefit of irradiation for at least four treatments. If satisfactory improve-

ment is not noted at the end of this time, irradiation should be discontinued, and the condition regarded as surgical. If the improvement is satisfactory, irradiation should be continued. The authors admit that irradiation does not increase the difficulty of subsequent operation, but irradiation before operation renders a patient a better surgical risk. The danger of hypothyroidism is negligible. The basal metabolism test is an important adjunct and the treatment of every patient should be governed by it. In severe cases the patient should be hospitalized and a period of rest obtained before treatment is begun and following the first one or two exposures.

Laryngeal Tuberculosis. E. E. Glenn and B. J. McGinnis. J. Mo. St. Med. Assn., 27: 7-10, Jan., 1930.

Tuberculous laryngitis is a frequent and serious complication of pulmonary tuberculosis.

Treatment of laryngeal tuberculosis is worth while if the symptoms of the disease can be relieved and the character of the lesions improved.

The water-cooled mercury quartz lamp with laryngeal applicator has been used by us in the treatment of seventy-seven cases of laryngeal tuberculosis.

Eighty-nine and six-tenths per cent of cases treated have shown improvement or apparent arrest.

Practically uniform relief from pain and dysphagia has been given by the treatments.

We feel that this is the most effective method of applying ultraviolet light to tuberculous lesions of the larynx and that the treatment is justified if for no other reason than affording symptomatic relief.

The Increased Tolerance of Pregnant Rabbits for Insulin. George Van S. Smith and George A. Marks. Surg. Gynec. Obst., 50: 586-593.

A group of 51 albino rats was exposed to heavy ovarian radium treatments, before they were mated. Each of these animals later cast one or more litters. The total first generation young amounted to 402. Of these, 17 females gave birth to 91 offspring (second generation), after mating with brothers, or with males born of other irradiated mothers.

No instance of abortion was observed in either generation.

In the irradiated animals either sterilization resulted or else the treatment did not materially alter the frequency with which subsequent conceptions followed one another.

Litter size was diminished by maternal ovarian irradiation, the earliest litters being the smallest.

The first generation young exhibited a delay in growth and fertility but presented no gross abnormalities which could reasonably be ascribed to the effect of the maternal irradiation.

Likewise the second generation of offspring showed no evidence of ill health or underdevelopment which might be attributed to the grandmaternal irradiation.

From this study no definite conclusion can be drawn in regard to the influence of preconception ovarian irradiation upon the health and development of the subsequent offspring of the albino rat. It is significant, however, that no gross structural abnormalities attributable to maternal ovarian irradiation were observed among 493 first and second generation descendants of a group of animals which received preconception ovarian radium irradiation.

Cancer In and About the Mouth. V. P. Blair, J. B. Brown and N. A. Womack. Internat. J. Orthodontia., 16:188-209, Febr., 1930.

Cases are grouped into fairly definite anatomic sites chiefly because of their relation to treatment and prognosis, and to facilitate classification, history-taking and presentation.

The term "carcinoma of the jaw" is not used because bone involvement is secondary and only incidentally influences treatment.

Growths with wide extension or metastases are put in the group corresponding to the primary growth site. Neck tumors do occur in which no primary growth site can be determined, but the majority of them are metastatic from some unrecognized upper respiratory or digestive tract growth.

Four arbitrary clinical stages are distinguished and are of practical use in giving a basis for treatment and prognosis from clinical findings.

Biopsies are done in most cases before treatment is begun, both for confirmation of diagnosis and for studying the relative degree of malignancy of the growth.

In arriving at a plan of treatment and prognosis, clinical and microscopic findings are considered together. No one criterion has been found to offer a basis of prognosis accurate enough to present a percentage plan to the patient of his chances of life.

Growths may for a time be held in relative abeyance, but later take on much more rapid growth if not a real increase in malignancy. In this series there is a higher percentage of undifferentiated growths in the late than in the early stages.

There has been observed a type of growth that in clinical aspects is cancer, but in which the microscopic pictures does not show the typical definition of cancer. These growths may cause great destruction if not treated at least locally as cancer.

The degree of malignancy of metastatic gland carcinoma followed fairly closely that of the primary growth. There may be no microscopic evidence of

malignancy in the regional glands, but this does not necessarily mean that the glands are not affected.

Though results are, of course, best in the cases where no carcinoma was found in the glands, there are cases in the series that show that undifferentiated carcinoma even in the glands of the neck is not an absolutely hopeless situation.

There is a high operative mortality, 21.5 per cent; all but one of the deaths occurred in advanced cases where any radical operations had been done.

The farther back in the mouth and pharynx the operation is carried, the higher the mortality. This is probably due to increased liability to respiratory infection.

Results of treatment are tabulated.

An Inquiry Into the Basic Cause and Nature of Cervical Cancer. K. V. Bailey. Surg. Gynec. Obst., 50:513-532, Mar., 1930.

The author's summary follows:

In this part of my work I have attempted to describe in some detail the pathology of so-called erosion of the cervix. As I have said elsewhere, my object in doing this has been to elucidate a subject in all its phases, which is recognized to be a definite stepping stone in the production of cancer. I consider that it is only by tracing the life history of erosion step by step, that one may acquire the necessary knowledge of associated cellular changes that is essential in the study of its all important sequel. To this end, therefore, I have extracted the necessary details from my series of 350 specimens which have gone to the formation of, I fear, a somewhat prolonged and labored dissertation.

In summarizing this part of my subject, I am unable to resist joining with many previous authors in an attack upon the old nomenclature. The term "erosion" is an entirely erroneous one in this connection from the pathological standpoint. This term was primarily applied as a facile description of the gross appearance of certain aspects of the condition only, purely a clinical nickname, instituted in the days when the science of morbid anatomy, as applied to gynecology, was by no means as advanced as it is today, and in any case, as a clinical term contrary to the laws of medical terminology today, founded as it is upon a pathological basis. The pathology of this condition determines its etiology from an infective or irritative source, and of these two I have no doubt that the former is a correct assumption. In either case, however, a typical inflammatory reaction of some degree is always in association and therefore the term cervicitis is the only applicable one.

Now we know that infection limited to the cervical glands results in an appearance differing from that under discussion, hence necessitating a distinct nomenclature. Also Moench definitely states the congenital origin of certain erosions seen in the virgin and assigns to them the term congenital pseudo-erosion. In this connection I would say that cases of this type, in which one could definitely dissociate the element of infection histolog-

ically, must be very rare. In my series I have only three specimens of the virgin cervix in which there can be no question of infection. A definite erosion is not present in any. However, I do not dispute the view held by Moench. My own is that this class is a very minor one.

I would, therefore, assert that the correct nomenclature in the group of cases hitherto known as proliferative erosion is peri-ocular cervicitis; that the ulcerative erosion which I have described should be termed ulcerative cervicitis; and that infection limited to the cervical glands is properly termed glandular cervicitis.

Broadly speaking, this lesion (erosion) is produced by the effect of the inflammatory reaction, locally applied in the region of the external cervical os, for varying lengths of time; and the reaction of the involved tissues to it. A temporary attack, or one the virulence of which is quickly combated by the patient's resistance, results in a temporary primary destructive phase (State 1), which represents a true erosion of the normal surface, followed by epithelial reactive activities progressing to healing (Stages 2, 3, 4, 5). An attack of greater virulence or one of which is relatively weakly combated by the patient's powers of resistance results in a prolonged battle between the invasive element and the involved tissue. The resistance is slow. The virulence of the invader is but slowly overcome. Loss of tissue combined with penetration of the irritant is concurrent with

organization of the exudates and the attenuation of the causal agent. A state of chronicity exists, which is represented by a typical appearance and is attended by typical epithelial reactions, ulceration. This state, that of ulceration, represents true erosion of the normal tissue surface, as also does the temporary State 1 of the proliferative type. These two conditions then might truly be spoken of as erosions, if necessary, although the term from a scientific point of view remains crude.

I will have failed in my purpose if I have been unable to convey the impression of histological accuracy in the discussion of this subject just concluded. It has been toward a thorough understanding of the tissue reactions concerned in cervical erosion that I have concentrated in my study of this condition, and to that end I have preferred to trace its histological life history step by step. At this stage, therefore, the various aspects of erosion in all its phases, its degrees, its associated cellular activities (which I shall speak of later), its histological eccentricities almost, are now understood as the result of this routine examination. The ultimate sequel to erosion is malignancy, but there is the phase malignant phase which must contain the primary malignant phase which must contain the primary malignant reactions. In this work I have aimed at the recognition beyond doubt of these earliest manifestations of cancerous change, in the hope that some light may thereby be thrown upon the origin of this disease.

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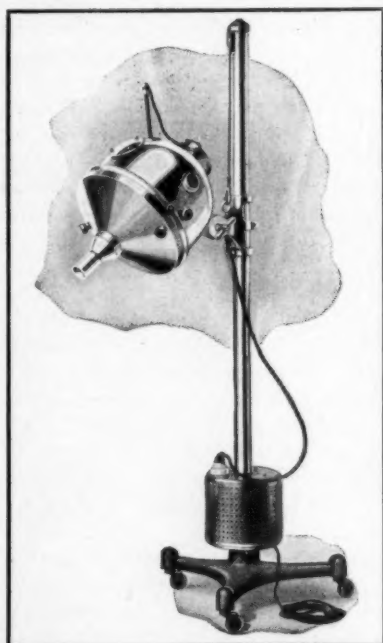
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